ISSN 1333-6347 (Print)
ISSN 2975-7452 (Online)

Izvorni znanstveni rad
Original scientific paper

Obrazovni sustav u vrijeme školovanja Nikole Tesle u Hrvatskoj

Education system during Nikola Tesla's schooling in Croatia

Antun Milinković*, Sanda Furjanić, Tanja Mihaljević

Gimnazija Karlovac, Rakovac 4, HR-47000 Karlovac, Hrvatska / Croatia

antun.milinkovic1@skole.hr, sandafurjanic@gmail.com, tanjamihaljevic360@gmail.com

Primljeno /*Received*: 2025-03-24; Prihvaćeno/*Accepted*: 2025-10-26
Rukopis je predan na hrvatskom jeziku / *Manuscript submitted in Croatian*

SAŽETAK

U vrijeme školovanja Nikole Tesle osnovnoškolski sustav činile su trorazredne i četverorazredne škole u kojima je četvrti razred mogao trajati dvije godine. U rodnom Smiljanu Tesla je pohađao trogodišnju školu, a u Gospiću je nastavio osnovnoškolsko obrazovanje te tri niža razreda realke. Nastavak srednjoškolskog obrazovanja u Carskoj i kraljevskoj velikoj realki u Rakovcu (danas dio grada Karlovca) usmjerava ga prema prirodoslovlju, naročito prema fizici, zahvaljujući odličnoj opremljenosti škole nastavnim učilima, knjigama, kabinetskoj nastavi i radu vrhunskih profesora među kojima se ističe Martin Sekulić. Ispit zrelosti položio je godine 1873. U povodu 150. obljetnice ma-

SUMMARY

During Nikola Tesla's education, the primary schooling system consisted of three-year schools and four-year schools, where fourth grade could last for two years. In his native Smiljan, Tesla attended a three-year school, and in Gospić he continued his primary education and the three lower grades of his secondary education. He continued his education at the The Imperial and Royal Grammar School (Realschule) in Rakovac (now part of the city of Karlovac), where he was oriented towards the natural sciences, especially physics, thanks to the school's excellent teaching equipments, books, laboratory instruction, and the work of top professors, among whom Martin Sekulić stood

* Adresa autora za dopisivanje / *Author's correspondence address:*
E-pošta / *E-mail*: antun.milinkovic1@skole.hr

ture Gimnazija Karlovac, sljednica Carske i kraljevske velike realke, priredila je izložbu nastavnih učila i knjiga iz vremena Teslina školovanja koje su zaštićeno kulturno dobro Republike Hrvatske.

KLJUČNE RIJEČI: **Nikola Tesla**, fizika, nastavna pomagala, obrazovanje, prirodoslovlje, Velika realka

UVOD

U vrijeme školovanja Nikole Tesle u Hrvatskoj obrazovni sustav djelovao je prema zakonima o školstvu iz 1854. koji su proizašli iz smjernica reforme školstva provedene sredinom 19. st. Pripreme za tu reformu započele su još u trećem desetljeću 19. st., a temeljile su se na pruskom školskom sustavu iz 18. st. i odnosile su se na osnovne i srednje škole. Carska naredba o osnivanju pučkih škola u Hrvatskoj bila je na snazi sve do donošenja hrvatskoga autonomnoga školskog zakona godine 1874. [1].

OSNOVNE ŠKOLE U 19. ST. NA PODRUČJU SLAVONIJE, HRVATSKE, DALMACIJE I VOJNE KRAJINE

Osnivanje prvih osnovnih ili pučkih škola u Habsburškoj Monarhiji započinje već u 18. st. Naredbama carice i kraljice Marije Terezije, a još više njezina sina Josipa II., na čitavom području Slavonije, Hrvatske, Dalmacije i Vojne krajine u svim većim mjestima osnivaju se osnovne škole. Postojala su tri tipa osnovnih škola – trivijalne, glavne i normalne škole.

out. He passed his final examination in 1873. To mark the 150th anniversary of his graduation, Gimnazija Karlovac, the successor of The Imperial and Royal Grammar School in Rakovac, organized an exhibition of teaching equipment and books from Tesla's time at school, which are protected cultural assets of the Republic of Croatia.

KEYWORDS: **Nikola Tesla**, education, natural history, physics, Realschule, teaching equipment

INTRODUCTION

During Nikola Tesla's schooling in Croatia, the educational system operated under the 1854 education laws that stemmed from the guidelines of the mid-19th-century school reform. Preparations for this reform began as early as the third decade of the 19th century; they were based on the Prussian school system of the 18th century, and they applied to primary and secondary schools. The imperial decree establishing public schools in Croatia remained in effect until the adoption of the first autonomous Croatian school law in 1874. [1]

ELEMENTARY SCHOOLS IN SLAVONIA, CROATIA, DALMATIA AND THE MILITARY FRONTIER IN THE 19TH CENTURY

The establishment of the first elementary or public schools in the Habsburg Monarchy began as early as the 18th century. By orders of Empress and Queen Maria Theresa, and even more so of her son

Trivijalne škole bile su elementarne škole koje su se nalazile u sjedištima župa. U njima je radio jedan učitelj i kateheta, a po potrebi i učiteljski pomoćnik [2]. Na području Vojne krajine učitelji su bili uglavnom stariji podčasnici. U školama se učilo elementarno gradivo iz predmeta vjeronauk, biblijska povijest, čitanje i pisanje (na njemačkom jeziku), računanje do trojnog pravila te nauka o poštenju i gospodarstvu. Glavne škole osnivale su se u svakom okružju i u njima su radila tri do četiri učitelja i kateheta ([2], str. 28). Osim predmeta koji su se učili u trivijalnim školama, u glavnim su školama bili zastupljeni i ovi predmeti: početci latinskoga jezika, zemljopis i povijest, naputci za pisane sastavke, risanje i mjerstvo te početci kućnoga i poljskoga gospodarstva. Glavne škole imale su četiri razreda, a četvrti razred mogao je trajati dvije godine. U tom su razredu prevladavali realni predmeti važni za daljnje osposobljavanje učenika u određenim strukama. Iz tih škola nakon reforme sredinom 19. st. realke započinju svoj samostalni razvoj ([2], str. 31). Normalne škole imale su isti program kao i glavne škole, a mogle su imati i dva godišta četvrtog razreda. Te su škole bile usmjerene na obrazovanje učiteljskoga podmlatka. Tadašnje obrazovanje učitelja bilo je u sastavu osnovnog obrazovanja i još nije bilo na razini srednjoškolskoga. Normalne škole osiguravale su mogućnost učiteljskog obrazovanja za one koji nisu namjeravali nastaviti srednjoškolsko obrazovanje. Učiteljske kandidate u pedagogiji podučavao je ravnatelj. Normalne osnovne škole postaju

Joseph II, elementary schools were established in all larger towns throughout Slavonia, Croatia, Dalmatia, and the Military Frontier. There were three types of elementary schools – trivium, main, and normal schools. Trivium schools were elementary schools located in parish seats. They were run by one teacher and a catechist, and, when necessary, a teaching assistant [2]. In the Military Frontier region, teachers were mostly older non-commissioned officers. The schools taught basic subjects: religion, biblical history, reading and writing (in German), arithmetic up to the rule of three, and lessons in honesty and economy. Main schools were established in each district, and they were staffed by three to four teachers and catechists ([2], p. 28). In addition to the subjects taught in the trivium schools, the higher schools also included the following subjects: the rudiments of Latin, geography and history, instruction in writing compositions, drawing and measurement, and the basics of household and farm management. The main schools had four grades, and the fourth grade could last two years. In that grade, the emphasis was on general subjects important for further training of students in specific professions. After the mid-19th-century reform, real schools began their independent development out of these institutions ([2], p. 31). Normal schools had the same curriculum as primary schools and could also have a two-year fourth grade. These schools were focused on educating future teachers. At that time, teacher education was part of primary education and was not yet at the secondary school level. Normal schools provid-

tako ishodište za kasnije učiteljske škole ili preparandije.

GIMNAZIJE I REALKE U 19. ST. NA PODRUČJU SLAVONIJE, HRVATSKE, DALMACIJE I VOJNE KRAJINE

Prema zakonu o srednjim školama iz 1854. „Osnova za organizaciju austrijskih gimnazija i realki" postala je važeća za sve zemlje Austrijskoga Carstva, kasnije Austro-Ugarske Monarhije, do nove reforme koje će se provesti krajem 70-ih i početkom 80-ih godina 19. st. U području srednjoškolskoga obrazovanja reforme su bile znatno zahtjevnije i složenije zbog potreba za novim zvanjima i stvaranja prikladnih škola koje će polaznicima pružiti kvalitetno znanje te ih osposobiti za određene struke važne u gospodarskom razvoju društva u novim ekonomskim odnosima i djelatnostima koje proizlaze iz industrijske i znanstvene revolucije ([1], str.17). Takav pristup reformi zahtijevao je velike promjene u oblikovanju ne samo novih profila škola već i izradu potpuno novih nastavnih programa, uvođenje novih predmeta, izradu i proizvodnju novih i suvremenih nastavnih pomagala, a naročito udžbenika. U nastavnim programima sve je izraženija potreba za povećanjem satnice prirodoslovnih predmeta. Budući da su se viša učilišta, među kojima su prevladavala tehnička, zasnivala na temeljnim prirodoslovnim znanostima i matematici, u srednjoškolski sustav uveden je novi oblik škola koje dobivaju naziv *realke*. Stoga su gimnazijski

ed teacher training for those who did not intend to continue with secondary education. The principal taught pedagogy to the teacher candidates. Normal elementary schools thus became the forerunners of later teacher's colleges or preparatory schools.

SECONDARY EDUCATION IN SLAVONIA, CROATIA, DALMATIA AND THE MILITARY FRONTIER IN THE 19TH CENTURY

According to the 1854 Secondary Schools Act, the „Foundation for the Organization of Austrian Gymnasiums and Realgymnasiums" became effective in all territories of the Austrian Empire, later the Austro-Hungarian Monarchy, until new reforms were implemented in the late 1870s and early 1880s. In the field of secondary education, reforms were considerably more demanding and complex due to the need for new titles and the creation of suitable schools that would provide students with a quality education and prepare them for specific professions important for the economic development of society in the new economic relations and activities that arise from the industrial and scientific revolution ([1], p. 17). Such an approach to reform required major changes in shaping not only the new school profiles but also the development of entirely new curricula, the introduction of new subjects, the creation and production of new and modern teaching aids, and especially textbooks. In the curricula, the need to increase the number of hours for natural science subjects became increasingly apparent.

programi osim dominirajućih društvenih i humanističkih predmeta sadržavali i predmete iz područja prirodoslovlja, a programi realke uz osnove društvenih i humanističkih predmeta sadržavale su veći udio predmeta iz prirodoslovlja, matematike te gospodarstva ([1], str.18).

Gimnazije su prema novom ustroju postale osmorazredne škole (do reforme bile su petorazredne s tri niža, gramatikalna razreda te dva viša, humanitarna razreda) koje se sastoje od četiri niža i četiri završna razreda. Mala ili donja gimnazija bila je samostalna škola nakon koje su učenici mogli nastaviti školovanje na višoj ili gornjoj gimnaziji ili odabrati školovanje u drugim profilima škola u kojima bi stjecali određena zvanja ([1], str.19).

Realke su bile šestorazredne škole i sastojale su se od tri niža i tri viša razreda. Učenici koji su završili veliku realku mogli su upisati neku od tehničkih škola ili viših učilišta polaganjem prijamnog ispita, dok su učenici gimnazija nakon ispita zrelosti mogli nastaviti školovanje na sveučilištima te upisati željeni fakultet bez prijamnog ispita. Od školske godine 1869./1870. u realke je uveden ispit zrelosti, stoga učenici nisu morali polagati prijamne ispite kao uvjet za upis na više škole, a školske godine 1871./1872. uveden je i 7. razred kako bi se postigao dovoljan stupanj obrazovanja za nastavak školovanja. Krajem 19. st. realke postaju osmorazredne škole i dobivaju status realnih gimnazija uz određene programske izmjene ([1], str. 161-163).

Rakovačka realka započela je djelovati školske godine 1851./1852. kao „Niža

Since higher education institutions, among which technical ones predominated, were based on fundamental natural sciences and mathematics, a new type of school was introduced into the secondary education system, which came to be called the *realschule*. Therefore, the *gymnasium* programs, in addition to the dominant social and humanities subjects, also included subjects from the natural sciences, while the *real school* programs, alongside the basics of social and humanities subjects, contained a larger share of subjects from the natural sciences, mathematics, and economics ([1], p. 18).

Under the new system, *gymnasiums* became eight-year schools (before the reform they were five-year schools with three lower, grammatical grades and two upper, humanistic grades), consisting of four lower grades and four final grades. The lower or small gymnasium was an independent school after which students could continue their education at the upper gymnasium or choose to attend other types of schools where they would earn specific qualifications ([1], p. 19).

Realgymnasia were six-year schools and they consisted of three lower and three upper grades. Students who completed the higher realschule could enroll in a technical school or a higher institution by passing an entrance exam, while students from *gymnasiums*, after passing their final, maturitiy exam, could continue their education at universities and enroll in their desired faculty without an entrance exam. Beginning with the 1869/1870 school year, a maturity exam was introduced in *realschools*, so students did not have to take entrance exams as a require-

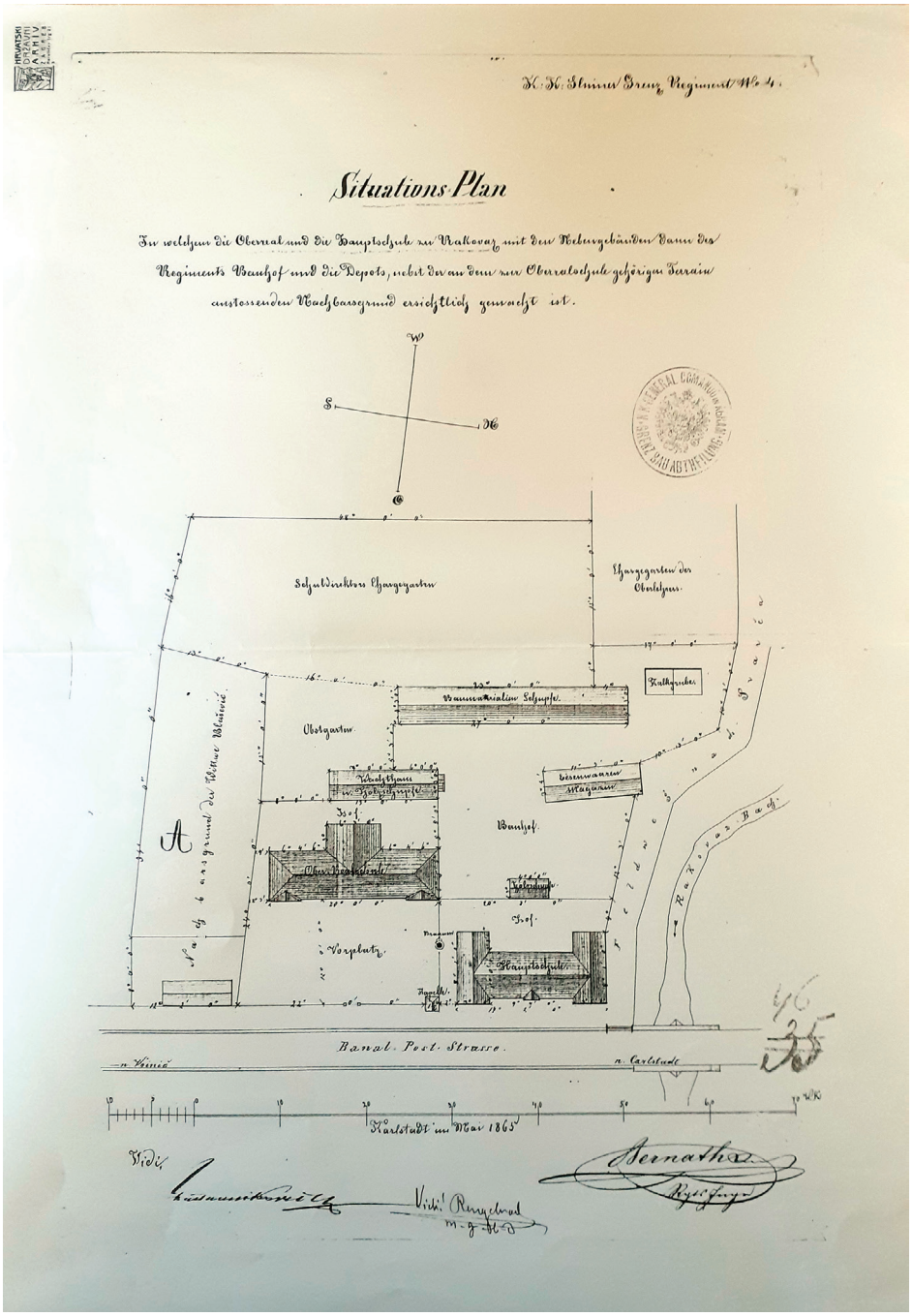
nesamostalna realka“ jer je bila u sklopu ogledne normalne osnovne škole („Muster-Normal-Haupschule zu Rakovac“). Školske godine 1863./1864., nakon izgradnje nove školske zgrade (slika 1) [3] primjerene suvremenoj nastavi, postaje „Carska i kraljevska velika realka u Rakovcu u Vojnoj krajini“ („K. k. Ober-Realschule zu Rakovac in der k. k. kroatischen Militär Grenze“) i djeluje do godine 1882. Tada se odlukom cara Franje Josipa I. spaja s „Kraljevskom velikom gimnazijom Karlovac“ u jednu ustanovu pod nazivom „Kraljevska velika realna gimnazija u Rakovcu“.

„Njegovo ces. i kr. apostolsko Veličanstvo blagoizvoljelo je previšnjim riešenjem od dne 1. augusta t. g. premilostivo dozvoliti da se tamošnja (rakovačka) velika realka i velika gymnasija u Karlovcu spoje i pretvore u podpunu višu realnu gymnasiju u Rakovcu. U svrhu provedbe te previšnje odluke nalazi ovaj kr. zemaljsko-vladni odjel predbježno odrediti sljedeće: Tamošnji (rakovački) učevni zavod imati će se postepeno pretvoriti u podpunu realnu gymnasiju od 11 razreda, od kojih će biti dolnja 4 razreda glede svih učevnih predmeta zajedničkim realnim i gymnasijskim učenikom, u viših pako razrednih biti će obuka zajednička samo glede vjeronauka, hrvatskoga jezika, njemačkoga jezika i logike...“ [4].

Realka je najdulje djelovala u sklopu Vojne krajine kada je bila pod upravom Beča te je nastavni jezik bio njemački. Nakon ukidanja Vojne krajine 1871. hrvatski jezik uveden je u nastavu povijesti i vjeronauka. Ostali predmeti i dalje se poment for admission to higher schools. In the 1871/1872 school year, a 7th grade was also introduced to achieve a sufficient level of education for further schooling. By the end of the 19th century, the realke became eight-grade schools and were granted the status of real gymnasiums with certain curricular changes ([1], pp. 161-163).

The Rakovac Realschule began operating in the 1851/1852 school year as a „Lower Independent Realschule“ because it was part of the model normal elementary school („Muster-Normal-Haupschule zu Rakovac“). In the 1863/1864 school year, after the construction of a new school building (Figure 1) [3] suitable for modern instruction, it became the „Imperial and Royal Higher Real School in Rakovac in the Military Frontier“ („K. k. Ober-Realschule zu Rakovac in der k. k. kroatischen Militär Grenze“) and operated until 1882. At that time, by decree of Emperor Franz Joseph I, it was merged with the „Royal Upper Gymnasium Karlovac“ into a single institution named the „Royal Upper Real Gymnasium in Rakovac“.

„His Imperial and Royal Apostolic Majesty has graciously decreed by a supreme resolution dated August 1 of this year that the existing (Rakovec) high real school and the high gymnasium in Karlovac be merged and converted into a full higher real gymnasium in Rakovec. For the purpose of carrying out this supreme decision, this Royal Provincial Government Department hereby provisionally orders the following: The aforementioned (Rakovec) educational institution is to be gradually converted into a complete 11-grade real gymnasium, of which the lower 4 grades will have a common curriculum



Slika 1. **Plan Velike realke u Rakovcu i okolnih objekata iz godine 1864.**

Figure 1. ***The plan of the Imperial and Royal Vocational Grammar School (Realschule) in Rakovac and surrounding facilities from 1864.***

učavaju na njemačkom jeziku jer je Vojna krajina pripojena matici zemlji tek godine 1881.

ŠKOLOVANJE NIKOLE TESLE U LICI

Svoje školovanje Nikola Tesla započeo je u rodnom Smiljanu gdje je završio Krajišku trivijalku, a nakon preseljenja obitelji u Gospić nastavlja obrazovanje u normalnoj osnovnoj školi („Normal--Hauptschule zu Gospic"). Srednjoškolsko obrazovanje započinje također u Gospiću pohađanjem „Carske i kraljevske male realke u Gospiću" („K. k. Unter-Realschule zu Gospic in der k. k. kroatischen Militär Grenze") u trajanju od tri godine. Realka u Gospiću (slike 2, 3) [5] osnovana je na zahtjev pukovnika Adolfa pl. Bermanna uz dozvolu cara Franje Josipa I. rješenjem od 16. veljače 1860., a 1878. četverorazredna realka uz dozvolu cara postaje „Velika kraljevska gimnazija Gospić". Budući da su nastavni programi za isti profil škola bili jedinstveni, iz izvješća rakovačke Realke šezdesetih godina 19. st. može se utvrditi koje su predmete učenici učili u nižoj realki.

U prvom razredu niže realke nastavni program obuhvaćao je nastavne sadržaje iz predmeta: vjeronauk (2 sata tjedno), njemački jezik (5 sati tjedno), hrvatski jezik (5 sati tjedno), geografija i povijest (3 sata tjedno), aritmetika (4 sata tjedno), geometrija i geometrijsko crtanje (9 sati tjedno), prirodopis (2 sata tjedno) i kaligrafija (2 sata tjedno) [6].

for real and gymnasium students in all subjects, while in the upper grades, the curriculum will be common only for religious instruction, Croatian, German, and Logic..." [4].

The *Realka* operated for the longest time as part of the Military Frontier when it was under the administration of Vienna, and the language of instruction was German. After the abolition of the Military Frontier in 1871, the Croatian language was introduced into history and religion classes. Other subjects continued to be taught in German because the Military Frontier was only annexed to the mother country in 1881.

NIKOLA TESLA'S EDUCATION IN LIKA

Nikola Tesla began his schooling in his native Smiljan, where he completed the Krajiska Trivial School, and after his family moved to Gospić, he continued his education at the Normal Elementary School („Normal-Hauptschule zu Gospić"). His secondary education also began in Gospić, attending the „Imperial and Royal Lower Real Gymnasium in Gospić" („K. k. Unter-Realschule zu Gospić in der k. k. kroatischen Militär Grenze") for three years. The Real Gymnasium in Gospić (Figures 2, 3) [5]. It was established at the request of Colonel Adolf pl. Berman, with the permission of Emperor Franz Joseph I, by decree of February 16, 1860, and in 1878, the four-class real school, with the emperor's permission, became the „Gospić Royal High School". Since the curricula for the same type of school were uniform, a report from the Rakovac Real

Slika 2. **Zgrada Carske i kraljevske male realke u Gospiću, danas zgrada Odjela za nastavničke studije u Gospiću Sveučilišta u Zadru**

Figure 2. ***The building of the Imperial and Royal Elementary Vocational Grammar School in Gospić, today it is The Department for Teacher Studies in Gospić whic belongs to the University of Zadar***

Slika 3. **Pročelje zgrade Carske i kraljevske male realke u Gospiću sa spomen-pločom posvećenom Nikoli Tesli**

Figure 3. ***The facade of the building of the Imperial and Royal Elementary Vocational Grammar School in Gospić with commemorative plaque dedicated to Nikola Tesla***

U drugom razredu učili su se isti predmeti kao u prvom razredu, ali se aritmetika poučavala 3 sata tjedno, geometrija i geometrijsko crtanje 4 sata tjedno, a prirodopis se učio samo u prvom polugodištu 2 sata tjedno. Novi predmeti bili su fizika (2 sata tjedno u prvom polugodištu i 4 sata u drugom), gospodarstvo (2 sata tjedno) i prostoručno crtanje (5 sati tjedno) ([6], str.19).

U trećem razredu nije se više učila geometrija i geometrijsko crtanje, prirodopis i fizika. Svi ostali predmeti isti su kao u drugom razredu, ali je povećana satnica prostoručnog crtanja na 6 sati tjedno. Učio se i novi predmet kemija (5 sati tjedno) ([6], str. 20).

ŠKOLOVANJE NIKOLE TESLE U KARLOVCU

Srednjoškolsko je obrazovanje Nikola Tesla nastavio u Carskoj i kraljevskoj velikoj realki u Rakovcu gdje je 1870. upisao četvrti razred. Školske godine 1871./1872. iz četvrtoga razreda prelazi u šesti zato što škola postaje sedmogodišnja pa je između tri niža i tri viša ubačen još jedan razred.

Nastavni planovi u sedmogodišnjoj realki u vrijeme školovanja Nikole Tesle u Karlovcu (1870. – 1873.)

Nastavni planovi s popisom predmeta i njihovih sadržaja prikazani su u tablici 1.

Zbirka učila Gimnazije Karlovac – zaštićeno kulturno dobro Republike Hrvatske

Političko-teritorijalna pripadnost Realke Austriji osigurala je odlične uvjete za

Gymnasium from the 1860s can be used to determine which subjects students studied in the lower real gymnasium.

In the first grade of the lower secondary school, the curriculum included the following subjects: religious education (2 hours per week), German (5 hours per week), Croatian language (5 hours per week), geography and history (3 hours per week), arithmetic (4 hours per week), geometry and drawing (9 hours per week), natural science (2 hours per week), and penmanship (2 hours per week) [6].

In the second grade, the same subjects were taught as in the first grade, but arithmetic was taught for 3 hours per week, geometry and drawing for 4 hours per week, and natural science was taught for 2 hours per week in the first semester only. New subjects were physics (2 hours per week in the first semester and 4 hours in the second), economics (2 hours per week), and spatial drawing (5 hours per week) ([6], p. 19).

In the third grade, geometry and geometric drawing, natural science, and physics were no longer taught. All other subjects were the same as in the second grade, but the number of hours for spatial drawing was increased to 6 hours per week. A new subject, chemistry, was also taught (5 hours per week) ([6], p. 20).

NIKOLA TESLA'S EDUCATION IN KARLOVAC

Nikola Tesla continued his high school education at the Imperial and Royal Great Real Gymnasim in Rakovac, where he enrolled in the fourth grade in 1870. In the

Tablica 1. **Nastavni planovi s popisom predmeta i njihovih sadržaja**
Table 1. ***Teaching programmes with a list of subjects and their contents***

Predmet ***Subject***	**Sadržaj predmeta** ***Course content***	**Broj sati tjedno** ***Number of hours per week***
4. razred / *4th grade*		
Rimokatolički vjeronauk *Roman Catholic Catechism*	Prvi dio vjeronauka po dr. Martinu *Part one of the Catechism by Dr. Martin*	2
Pravoslavni vjeronauk *Orthodox Theology*	Liturgika *Liturgics*	2
Hrvatski jezik *Croatian Language*	Ponavljanje i nastavak Veberove gramatike, pisane zadaće s naglaskom na teme iz praktičnog života *Review and continuation of Vebers grammar (Grammar by Adolfo Veber Tkalčević), written assignments with emphasis on topics from practical life*	3
Njemački jezik *German Language*	Pregled cijele gramatike, vremena, značenje i srodnost riječi, temelji poezije i metrike *Overview of the entire grammar, tenses, meaning and relations between words foundations of poetry and metrics*	3
Zemljopis i Povijest *Geography* and *History*	Geografija Amerike i Australije, specijalna geografija Hrvatske, pregled zakona, pregled povijesti novog vijeka s posebnim osvrtom na domaću povijest *Geography of America and Australia, special geography of Croatia, survey of laws, survey of modern history with a special focus on domestic history*	4
Matematika *Mathematics*	Znanstvena obrada četiri vrste računanja s općim brojevima, razlomci, jednadžbe 1. stupnja s jednom i dvije nepoznanice, planimetrija pravocrtnih oblika *Scientific treatment of four operations with whole numbers, fractions, first-degree equations with one and two variables, plane geometry of linear shapes*	4
Prirodoslovje (Fizika) *Natural Sciences (Physics)*	Opći zakoni statike i dinamike tijela u sva tri agregatna stanja, zvuk i svjetlost *General laws of statics and dynamics of bodies in all three states of matter, sound and light*	3
Lučba (Kemija) *Chemistry*	Pregled najvažnijih kemijskih elemenata bez kemijskih reakcija *Overview of the most important chemical elements without chemical reactions*	3

Deskriptivna geometrija i geometrijsko crtanje *Descriptive Geometry and Geometric Drawing*	Zadaci iz planimetrije i stereometrije, krivulje u ravnini, pravokutna projekcija točke i pravca *Problems in plane and solid geometry, curves in the plane, orthogonal projection of a point and a line*	3
Prostoručno crtanje *Frehand Drawing*	Crtanje i sjenčanje dijelova tijela prema gipsanim modelima, usvajanje znanja i njegova primjena o proporcijama muškog tijela, izrada ornamenata u sepiji *Drawing and shading body parts based on plaster models, mastering and applying knowledge of human body proportions, creating ornaments in sepia*	4
5. razred / *5th grade*		
Rimokatolički vjeronauk *Roman Catholic Catechism*	Drugi dio vjeronauka po dr. Martinu *Part two of the Catechism by Dr. Martin*	2
Pravoslavni vjeronauk *Orthodox Theology*	Prošireni nauk vjere *Expanded doctrine of faith*	2
Hrvatski jezik *Croatian Language*	Poznavanje naše novije književnosti, čitanje i analiza književnih tekstova iz Velike čitanke književnosti 2. za višu gimnaziju, temeljna znanja i vještine iz retorike, školske i domaće zadaće prema propisu *Knowledge of our recent literature, reading and analysis of literary texts from the Great Literature Textbook 2 for upper grammar school, basic knowledge and skills in rhetorics, school and homework assignments as prescribed*	3
Njemački jezik *German Language*	Čitanje i prevođenje djela klasične književnosti *Reading and translating works of classical literature*	3
Francuski jezik *French Language*	Pravila izgovora, čitanja i naglašavanja, oblikovanje promjenjivih riječi, nepravilni i nepotpuni glagoli, najvažnija pravila sintakse, članovi, učenje riječi i fraza, usmene i pisane vježbe *Rules of pronunciation, reading and stress, formation of variable words, irregular and incomplete verbs, the most important rules of syntax, articles, learning words and phrases, oral and written exercises*	4
Zemljopis i Povijest *Geography* and *History*	Pragmatična povijest staroga svijeta s obzirom na zemljopis *A pragmatic history of the ancient world with reference to geography*	4
Matematika *Mathematics*	Ponavljanje opće aritmetike, jednadžbe s više nepoznanica, logaritmi, brojevni sustav, djeljivost brojeva, potencije, korijeni, imaginarni i kompleksni brojevi, omjeri, razmjeri, jednadžbe 2. stupnja, kružnica, ravna trigonometrija *Review of basic arithmetics, equations with multiple unknowns, logarithms, the number systems, divisibility of numbers, powers, roots, imaginary and complex numbers, ratios, proportions, quadratic equations, circles, plane trigonometry*	6

Naravopis (Biologija) *Natural History (Biology)*	Anatomija i fiziologija životinja s posebnim osvrtom na više životinje, sistematika i geografska rasprostranjenost životinja *Anatomy and physiology of animals with special reference to higher animals, systematics and geographical distribution of animals*	3
Lučba (Kemija) *Chemistry*	Nemetali, lužine, zemnoalkalijski spojevi i rude *Nonmetals, alkalis, alkaline earth compounds and ores*	2
Deskriptivna geometrija *Descriptive Geometry*	Ravnina, projekcija uglatih tijela, prostorno predočavanje, presjeci ravnina, znanost o krivuljama *Plane, projection of angular bodies, spatial representation, intersections of planes, science of curves*	3
Prostoručno crtanje *Frehand Drawing*	Crtanje antičkih modela i prirodnih objekata s anatomskog aspekta, crtanje složenijih stiliziranih ornamenata za uporabu, crtanje krajolika *Drawing classical models and natural objects from an anatomical perspective, drawing more complex stylized ornaments for use, drawing landscapes*	4
6. razred / *6th grade*		
Rimokatolički vjeronauk *Roman Catholic Catechism*	Treći dio vjeronauka (moralka) po dr. Martinu *The third part of religious education (morality) according to Dr. Martin*	2
Pravoslavni vjeronauk *Orthodox Theology*	Prošireni nauk vjere *Expanded doctrine of faith*	2
Hrvatski jezik *Croatian Language*	Opširnije poznavanje naše novije književnosti, nastavak čitanja i analize književnih tekstova iz Velike čitanke književnosti 2., važna znanja i vještine iz poetike, školske i domaće zadaće prema propisu *More extensive knowledge of our recent literature, continued reading and analysis of literary texts from the Great Literature Reader 2, important knowledge and skills in poetics, school and homework assignments as prescribed*	3
Njemački jezik *German Language*	Kratak pregled povijesti književnosti od 15. do 19. stoljeća s obzirom na kulturnu povijest, čitanje tekstova *A brief overview of the history of literature from the 15th to the 19th century in relation to cultural history, reading of texts*	2
Francuski jezik *French Language*	Ciljano ponavljanje gradiva 5. razreda, promjenjive i nepromjenjive vrste riječi, potpuno poznavanje sintakse *Targeted repetition of 5th-grade material, variable and invariable parts of speech, complete knowledge of syntax*	3
Zemljopis i Povijest *Geography* and *History*	Povijest od 6. do 17. stoljeća *History from the 6th to the 17th century*	4

Matematika *Mathematics*	Dvojni razlomci, diofantske jednadžbe, jednadžbe višeg stupnja, progresija, konvergencija i divergencija, kombinatorika, binomni poučak, stereometrija, temelji sferne trigonometrije *Double fractions, diophantine equations, higher-degree equations, progression, convergence and divergence, combinatorics, binomial theorem, stereometry, fundamentals of spherical trigonometry*	5
Naravopis (Biologija) *Natural History (Biology)*	Opća i specijalna botanika *General and Special Botany*	2
Prirodoslovje (Fizika) *Natural Sciences (Physics)*	Toplina, elektricitet i magnetizam, statika krutih i tekućih tvari na osnovi pokusa i popularne matematike *Heat, electricity, and magnetism, statics of solids and liquids based on experiments and popular mathematics*	4
Lučba (Kemija) *Chemistry*	Teški metali, organska kemija *Heavy metals, organic chemistry*	2
Deskriptivna geometrija *Descriptive Geometry*	Izdvajanje i predstavljanje krivih ploha, dodirne ravnine, kosa projekcija *Extraction and representation of curved surfaces, tangent planes, oblique projections*	3
Prostoručno crtanje *Frehand Drawing*	Crtanje antičkih modela i prirodnih objekata s anatomskog aspekta, crtanje složenijih stiliziranih ornamenata za uporabu, crtanje krajolika *Drawing ancient models and natural objects from an anatomical perspective, drawing more complex stylized ornaments for use, drawing landscapes*	4
7. razred / *7th grade*		
Rimokatolički vjeronauk *Roman Catholic Catechism*	Prijevod crkvene povijesti dr. Fesslera *Translation of Dr. Fessler's Church History*	2
Pravoslavni vjeronauk *Orthodox Theology*	Povijest kršćanske crkve *History of the Christian Church*	2
Hrvatski jezik *Croatian Language*	Čitanje i analiza književnih tekstova iz Velike čitanke književnosti 1. propisane za višu gimnaziju, pregled naše starije književnosti, temeljni pojmovi staroslavenskog jezika, temelji logike, školske i domaće zadaće prema propisu *Reading and analysis of literary texts from the Great Literature Textbook 1 prescribed for upper grammar school, an overview of our older literature, basic concepts of the Old Church Slavonic language, foundations of logic, school and homework assignments according to the regulations*	3

Njemački jezik *German Language*	Kratak pregled povijesti književnosti od 15. do 19. stoljeća s obzirom na kulturnu povijest, čitanje lakših djela iz toga razdoblja *A brief overview of the history of literature from the 15th to the 19th century in relation to cultural history, reading of lighter literary works from that period*	2
Francuski jezik *French Language*	Ponavljanje i dopunjavanje cjelokupne gramatike, nastavak vježbanja galicizama i važnijih sinonima, kratak pregled povijesti književnosti, čitanje važnijih djela u cijelosti *Revision and supplementing of the entire grammar, continuing to practice Gallicisms and important synonyms, a brief overview of the history of literature, reading important literary works in their entirety*	3
Zemljopis i Povijest *Geography* and *History*	Povijest od 18 i 19. stoljeća s naglaskom na kulturno-povijesna događanja, poznavanje domaćeg ustava *History of the 18th and 19th centuries with an emphasis on cultural and historical events, knowledge of the domestic constitution*	4
Matematika *Mathematics*	Nastavak sferne trigonometrije, temelji vjerojatnosti i postupna obrada višeg stupnja, analitička geometrija *Continuation of spherical trigonometry, foundations of probability and gradual processing of higher order, analytical geometry*	5
Naravopis (Biologija) *Natural History (Biology)*	Poznavanje najvažnijih ruda iz aspekta kristalografije, fizike i kemije, pregled geološke prošlosti *Knowledge of the most important ores from the aspect of crystallography, physics and chemistry, an overview of the geological past*	3
Prirodoslovje (Fizika) *Natural Sciences (Physics)*	Dinamika, titranje tijela, zvuk, svjetlost, teorija svjetlosti i topline, matematički zemljopis, popularno zvjezdarstvo (astronomija) na temelju pokusa, popularna matematika *Dynamics, vibration of bodies, sound, light, theory of light and heat, mathematical geography, popular experimental astronomy, popular mathematics*	4
Lučba (Kemija) *Chemistry*	Organska kemija *Organic chemistry*	2
Deskriptivna geometrija *Descriptive Geometry*	Centralna projekcija i ponavljanje *Central projection and repetition*	3

Prostoručno crtanje *Frehand Drawing*	Crtanje antičkih modela, prirodnih objekata s anatomskog aspekta, crtanje složenijih stiliziranih uporabnih ornamenata, crtanje krajolika *Drawing of classical models, natural objects from an anatomical perspective, drawing of more complex stylized functional ornaments, drawing of landscapes*	4
Učenici su mogli fakultativno pohađati: Francuski jezik, Hrvatsku stenografiju, Njemačku stenografiju, Pjevanje i Gimnastiku *Students could optionally attend:* *French Language, Croatian Stenography, German Stenography, Singing and Gymnastics*		

rad, opremanje škole najsuvremenijim nastavnim pomagalima, udžbenicima, stručnom literaturom i svim ostalim sredstvima neophodnima za uspješno ostvarenje nastavnih procesa. U to su vrijeme načinjene iznimno bogate prirodoslovne zbirke, izgrađeni kabineti, opservatoriji i vrtovi. Najintezivniji period opremanja škole bio je 70-ih godina 19. st., upravo u vrijeme kada je Nikola Tesla pohađao Carsku i kraljevsku veliku realku u Rakovcu.

Za uspješno izvođenje nastave i savladavanje nastavnih sadržaja škola je tada imala bogato opremljenu knjižnicu za profesore i knjižnicu za učenike, kabinet za prirodopis, fiziku, matematiku, kemijski laboratorij s odgovarajućim kemikalijama, priborom i uređajima te zvjezdarnicu.

Nastavna učila iz biologije (zaštićeno kuturno dobro Republike Hrvatske)

Na slikama 4-13 prikazana su nastavna učila iz biologije [7].

Za istraživanje sitnih objekata i struktura nevidljivih golim okom osnovni je laboratorijski instrument bio mikroskop (slika 4).

Pojedine zbirke imale su velik broj vrsta i primjeraka – zbirka kukaca (920 vr-

1871/1872 school year, he advanced from the fourth grade to the sixth because the school became a seven-year institution, and another grade was inserted between the three lower and three upper grades.

Lesson plans in the seven-year Realschule during Nikola Tesla's education in Karlovac (1870-1873)

The curricula, with a list of subjects and their content, are shown in Table 1.

Gimnazija Karlovac's teaching equipment – protected cultural property of the Republic of Croatia

The Realka's political-territorial affiliation with Austria ensured excellent working conditions, the equipping of the school with state-of-the-art teaching aids, textbooks, professional literature, and all other resources necessary for the successful implementation of the teaching process. During that time, exceptionally rich natural history collections were assembled, and cabinets, observatories, and gardens were built. The most intensive period of equipping the school was in the 1870s, precisely when Nikola Tesla attended the Imperial and Royal Real Gymnasium in Rakovac.

Slika 4. **Mikroskop**
Figure 4. ***The microscope***

Slika 5. **Dvije ljušturice puževa vrste *Ena montana* (Draparnaud, 1801)**
Figure 5. ***Two snail shells of species*** **Ena montana *(Draparnaud, 1801)***

For successful instruction and mastery of the curriculum, the school at that time had a well-equipped library for teachers and a library for students, a natural history classroom, a physics classroom, a mathematics classroom, a chemistry laboratory with the appropriate chemicals, equipment, and devices, and an observatory.

Biology teaching equipment (protected cultural property of the Republic of Croatia)

Figures 4-13 show the biology teaching equipments [7].

To research small objects and structures invisible to the naked eye, the basic laboratory instrument was the microscope (Figure 4).

Certain collections had a large number of species and specimens – the insect collection (920 species with 1 365 specimens), the malacological collection (207 mollusk species with 618 specimens, Figure 5), botanical collection (680 species with 743 specimens, Figure 6), mineralogical-geological collection (302 species with 1 036 specimens, Figure 7), paleontological collection (296 species with 2 724 specimens, Figure 8), a mycological collection with a large number of model mushroom fruiting bodies (Figure 9), a zoological collection with several hundred specimens (Figures 10-12), and a geographical-economic collection with a large number of lithographs (Figure 13).

Today's collection, a protected cultural asset of the Republic of Croatia, con-

Slika 6. **Nastavna drvena kutija sa staklenim poklopcem; predstavnici skupina biljnog carstva prema Linneovoj sistematici**

Figure 6. ***The Educational wooden box with a glass lid; overview of plant groups of The Kingdom of plants according to Linnaeus' system***

Slika 7. **Hematit (mineral željezov(III)-oksid, formule α-Fe2O3)**

Figure 7. ***Hematite (mineral ferric (III) oxide, formula α-Fe2O3)***

Slika 8. **Okamina jednodijelne ljušture glavonošca**

Figure 8. ***Fosil of a cephalopod with external shell***

Slika 9. **Model plodišta gljive stapčarke (Basidiomycota) jurjevka ili bijela đurđevača (*Agaricus pomonae* Lenz. 1831)**

Figure 9. ***Mushroom tours model of basidiomycete (Basidiomycota) St. George's mushroom (*Agaricus pomonae *Lenz. 1831)***

Slika 11. **Prirodni preparat kostura zadružnog koralja *Fungia agariciformis* Lamarck, 1801, prihvaćena kao *Fungia fungites* (Linnaeus, 1758) iz Crvenog mora, prepariran u radionici Wenzel (Vàcslav) Frič, obchod s přírodninami v Praze (Naturalienhandlung in Prag)**

Figure 11. ***Natural specimen of skeleton of cooperative coral* Fungia agariciformis *Lamarck 1801, valid name* Fungia fungites *(Linnaeus, 1758) from The Red Sea, stuffed in The Workshop of Wenzel (Vàcslav) Frič in Prag for the preparation and preservation of animals and plants, as well as for making models***

Slika 10. **Model ljušturice Polystomella aculeata d'Orbigny, 1846, prihvaćena kao Elphidium aculeatum (d'Orbigny, 1846) iz tercijara, na metalnom i drvenom nosaču, proizveden u radionici Wenzel (Vàcslav) Frič, obchod s přírodninami v Praze (Naturalienhandlung in Prag)**

Figure 10. ***Model of a foraminiferan shell Polystomella aculeata d'Orbigny, 1846 (valid name Elphidium aculeatum d'Orbigny, 1846) from Tertiary on a metal support with a wooden base***

Slika 12. **Mokri preparat bodljikaša u menzuri, sekcija (žvačnjak) jestivog ježinca, Echinus esculentus (Linnaeus, 1758), izrađen u radionici V. Hruby, Továrna učebných pomůcek, Praha – Košíře**

Figure 12. ***Wet preparation of echinoderm in a specimen jar, section of the mouth organ of the edible sea urchin, Echinus esculentus (Linnaeus, 1758), prepared in The Workshop of V. Hruby in Prag***

Slika 13. **Zidna nastavna slika iz gospodarstva na tvrdom papiru (litografija) s prikazom uzgoja dudova svilca, proizvedena u Beču u tvrtki Druck und Verlag des Artist. Lithogr. Institutes v. Ant. Hartinger, K. K. Hofchromolithograf. und d. Firma Ant. Hartinger & Sohn in Wien, Mariahilfestrasse 117**

Figure 13. ***The wall education economy lithograph with display of silk mulberry cultivation, produced in Vienna in factory Druck und Verlag des Artist. Lithogr. Institutes v. Ant. Hartinger, K. K. Hofchromolithograf. und d. Firma Ant. Hartinger & Sohn in Wien, Mariahilfestrasse 117***

sta s 1 365 primjeraka), malakološka zbirka (207 vrsta mekušaca sa 618 primjeraka, slika 5), botanička zbirka (680 vrsta sa 743 primjerka, slika 6), mineraloško-geološka zbirka (302 vrste s 1 036 primjeraka, slika 7), paleontološka (296 vrsta s 2 724 primjerka, slika 8), mikološka zbirka s ve-

tains 1 189 items. It is housed at the Karlovac Gymnasium, which inherited it as the successor to the Imperial and Royal Grand Real Gymnasium in Rakovac. A part of the collection was exhibited on the occasion of the 150th anniversary of Nikola Tesla's graduation in Karlovac.

likim brojem modela plodišta gljiva (slika 9), zoološka zbirka s nekoliko stotina preparata (slike 10-12) te geografsko-gospodarska zbirka s velikim brojem litografija (slika 13).

Današnja zbirka, zaštićeno kulturno dobro Republike Hrvatske, broji 1 189 izložaka. Čuva se u Gimnaziji Karlovac koja ju je baštinila kao sljednica Carske i kraljevske velike realke u Rakovcu. Dio zbirke izložen je u povodu 150. obljetnice mature Nikole Tesle u Karlovcu.

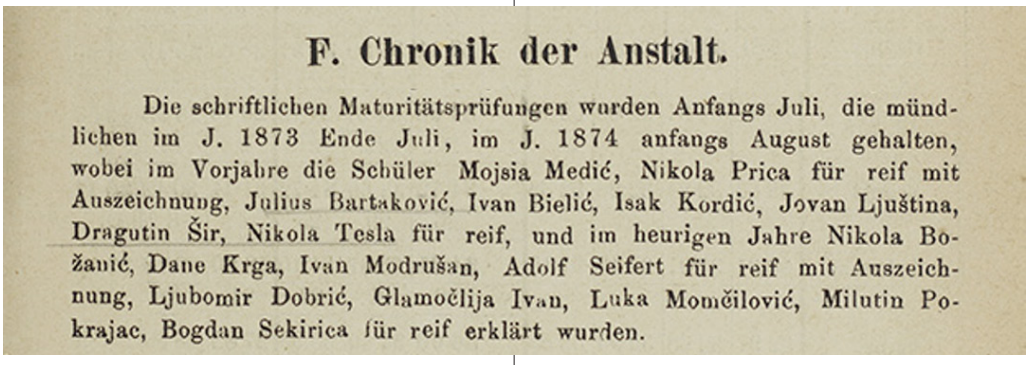
IZLOŽBA U POVODU 150. OBLJETNICE MATURE NIKOLE TESLE U KARLOVCU

Nikola Tesla maturirao je 24. srpnja 1873. (slike 14,15 [8], 16 [9]) u dobi od 17 godina, o čemu postoji bilješka na njemačkom jeziku na 55. stranici godišnjeg izvješća [8]. U bilješci između ostalog stoji da je Nikola Tesla, uz još sedam kandidata, položio ispit zrelosti.

THE EXHIBITION IN CELEBRATION OF THE 150TH ANNIVERSARY OF NIKOLA TESLA'S GRADUATION IN KARLOVAC

Nikola Tesla graduated on July 24, 1873. (Figures 14, 15 [8], 16 [9]) at the age of 17, which is documented in a German-language note on page 55 of the annual report [8]. The note states, among other things, that Nikola Tesla, along with seven other candidates, passed the maturity exam.

In 2023, on the occasion of the 150th anniversary of Tesla's graduation from the Karlovac Gymnasium, teaching equipments and books from the time of Nikola Tesla's attendance were exhibited. On display were 11 physical cabinet's teaching equipment, 20 exhibits from biology and chemistry (Figure 17), and books from biology, chemistry, physics, mathematics, technology, and mechanics (Table 2) [10].



F. Chronik der Anstalt.

Die schriftlichen Maturitätsprüfungen wurden Anfangs Juli, die mündlichen im J. 1873 Ende Juli, im J. 1874 anfangs August gehalten, wobei im Vorjahre die Schüler Mojsia Medić, Nikola Prica für reif mit Auszeichnung, Julius Bartaković, Ivan Bielić, Isak Kordić, Jovan Ljuština, Dragutin Šir, Nikola Tesla für reif, und im heurigen Jahre Nikola Božanić, Dane Krga, Ivan Modrušan, Adolf Seifert für reif mit Auszeichnung, Ljubomir Dobrić, Glamočlija Ivan, Luka Momčilović, Milutin Pokrajac, Bogdan Sekirica für reif erklärt wurden.

Slika 14. **Preslika bilješke iz *Osmog godišnjeg izvješća Carske i kraljevske velike realke u Rakovcu iz 1874.* u kojoj se spominje da je Nikola Tesla položio maturu**

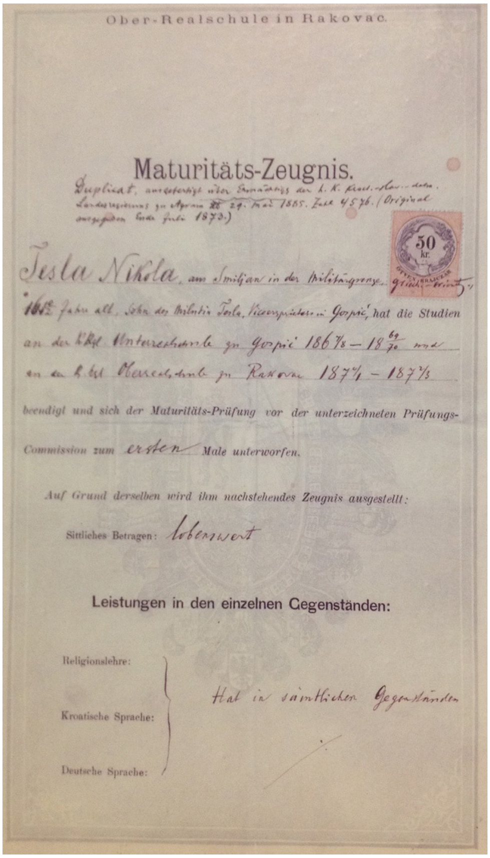
Figure 14. ***Copy notes of* The eighth annual report of the Imperial and Royal Vocational Grammar School (Realschule) in Rakovac in 1874. *in which it is mentioned that Nikola Tesla is graduated***

ZAPISNIK O MATURALNOM ISPITU ODRŽANOM U C. K. VELIKOJ REALKI U RAKOVCU NA KRAJU ŠKOLSKE GODINE 1872./1873.

PREDMETI	OCJENE
Moralno vladanje	pohvalno
Vjeronauk	pohvalno
Materinji jezik (Hrvatski)	zadovoljava
Drugi živi jezik (Njemački)	odličan
Geografija i povijest	odličan
Matematika	odličan
Nacrtna geometrija	zadovoljava
Prirodopis	pohvalno
Fizika	pohvalno
Kemija	pohvalno
Prostoručno risanje	dovoljno
Zrelost za tehničku školu	zreo

Slika 15. **Prijepis zapisnika s mature**

Figure 15. ***The transcript of maturity exam***



Ober-Realschule in Rakovac.

Maturitäts-Zeugnis.

Tesla Nikola ... hat die Studien an der ... beendigt und sich der Maturitäts-Prüfung vor der unterzeichneten Prüfungs-Commission zum ersten Male unterworfen.

Auf Grund derselben wird ihm nachstehendes Zeugnis ausgestellt:

Sittliches Betragen: lobenswert

Leistungen in den einzelnen Gegenständen:

Religionslehre:

Kroatische Sprache:

Deutsche Sprache:

Hat in sämtlichen Gegenständen

Slika 16. **Preslika Tesline maturalne svjedodžbe**

Figure 16. ***The transcript of Tesla's graduation certificate***

Slika 17. **Izloženi eksponati prirodoslovne zbirke (zaštićeno kulturno dobro Republike Hrvatske)**

Figure 17. Displayed exhibits of the natural sciences collection (protected cultural property of the Republic of Croatia)

U Gimnaziji Karlovac u povodu 150. obljetnice Tesline mature, godine 2023., izložena su nastavna pomagala i knjige iz kojih se učilo u nastavi u Carskoj i kraljevskoj velikoj realki kada ju je pohađao Nikola Tesla. Izloženo je 11 učila fizikalnog kabineta, 20 izložaka iz područja biologije i kemije (slika 17) te knjige iz biologije, kemije, fizike, matematike, tehnike i mehanike (tablica 2) [10].

Izloženi eksponati fizikalnog kabineta – učila iz fizike (zaštićeno kuturno dobro Hrvatske)

Učila fizikalnoga kabineta služila su za pokuse iz područja optike, mehanike, akustike, termodinamike, elektrostatike i elektrodinamike. Izrađivana su od biranih materijala – drva s politurom, stakla, mjedi, mramora, keramike i porculana. Proizvedena su u tvornicama specijaliziranima za izradu laboratorijskih instrumenata. Jedna je od poznatijih „Lenoir&Forster", osnovana godine 1850. u Beču, a za dio učila izrađivanih ručno u malim količinama nema podataka o proizvođaču. Neka se učila i danas koriste u nastavi fizike kao demonstracijsko sredstvo.

Nastavna učila iz fizike (zaštićeno kuturno dobro Republike Hrvatske)

Na slikama 18-28 prikazana su nastavna učila iz fizike (zaštićeno kulturno dobro Republike Hrvatske) [9,10].

Polarizator (slika 18) – optički sustav koji polarizira svjetlost. Sastoji se od dvije kristalne pločice organskog materijala. Pločice zasebno propuštaju svjetlost neovisno o položaju. Ukoliko ih se postavi

Exhibited physical cabinet's teaching equipments – physics teaching equipments (a protected cultural property of Croatia)

The physical cabinet's teaching equipment was used for experiments in the fields of optics, mechanics, acoustics, thermodynamics, electrostatics, and electrodynamics. They were made from selected materials – wood with a gilded finish, glass, brass, marble, ceramic, and porcelain. They were produced in factories specialized in the manufacture of laboratory instruments. One of the better-known manufacturers was „Lenoir & Forster", founded in 1850 in Vienna, but for some of the teaching equipment that was handmade in small quantities, the manufacturer is unknown. Some of these teaching aids are still used today in physics classes as demonstration tools.

Teaching equipment for physics (protected cultural property of the Republic of Croatia)

Figures 18-28 show teaching equipment for physics (protected cultural property of the Republic of Croatia) [9,10].

Polarizer (Figure 18) – an optical system that polarizes light. It consists of two crystal plates of organic material. The plates individually transmit light regardless of their position. If they are placed parallel to each other, the intensity of the light will depend on their relative position. When the crystal axes of the plates are parallel, the intensity is strongest, and when they are perpendicular, the plates are opaque.

paralelno jednu iznad druge, tada će intenzitet svjetlosti ovisiti o njihovu međusobnom položaju. Kada su kristalne osi pločica paralelne, intenzitet je najjači, a kada su okomite, pločice su neprozirne.

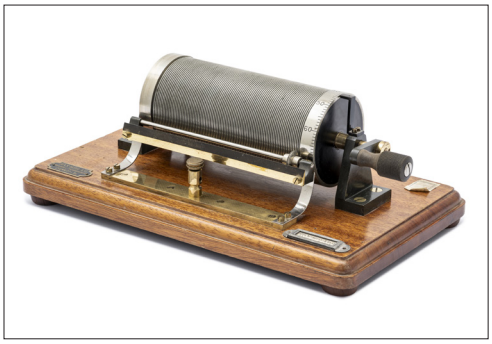
Slika 18. **Polarizator**
Figure 18. ***Polarizer***

Potenciometar (slika 19) – promjenljivi otpornik. Na njegovoj se površini nalazi klizač čijom se promjenom pozicije mijenja otpor na krajevima potenciometra. Ovaj otpornik iz druge polovice 19. stoljeća ima okretni mehanizam pomoću kojeg se mijenja otpor uređaja.

Danas su potenciometri u mnogim slučajevima zamijenjeni softverskom kontrolom iz mikroprocesorskog čipa.

Učilo za prikaz mehaničkih valova (slika 20) – demonstracijsko učilo koje prikazuje princip širenja mehaničkih valova. Mehanički valovi (valovi zvuka i valovi na vodi) za svoje širenje trebaju sredstvo. Prilikom širenja vala čestice sredstva

Potentiometer (Figure 19) – a variable resistor. A slider on its surface changes the resistance at the potentiometer's terminals by moving its position. This resistor from the second half of the 19th century has a rotating mechanism used to change the device's resistance. Today, potentiometers have in many cases been replaced by software control from a microprocessor chip.



Slika 19. **Potenciometar**
Figure 19. ***Potentiometer***

Teaching equipment for demonstrating mechanical waves (Figure 20) – a demonstration device that illustrates the principle of the propagation of mechanical waves. Mechanical waves (sound waves and waves on water) require a medium for their propagation. As the wave propagates, the particles of the medium vibrate and transfer energy to one another, and the disturbance spreads. This waveguide faithfully depicts the vibration of the medium's particles. It is considered a valuable exhibit because of its craftsmanship and the materials used. The lower part of the device is made of olive wood.

The Leyden jar (Figure 21) – the first form of electric condenser from 1745. It

titraju i prenose energiju jedna na drugu te se poremećaj širi. Taj valovod vjerno prikazuje titranje čestica sredstva. Smatra se vrijednim eksponatom zbog načina izrade i korištenih materijala. Donji dio učila izrađen je od drva masline.

Slika 20. **Učilo za prikaz mehaničkih valova**
Figure 20. ***Mechanical wave display device***

Leidenska boca (slika 21) – prvi oblik električnog kondenzatora iz godine 1745. Nastala je u nizozemskom gradu Leidenu prema kojemu je i dobila ime. Bila je to staklena boca punjena vodom ili živom i obložena staniolom (tankim srebrnastim listovima ili folijama kositra).

Prvi električni kondenzator svojom sposobnošću pohrane električne energije potaknuo je razvoj pokusa s elektricitetom, dok je snažna iskra nastala njegovim izbijanjem dala naslutiti potencijal tada novog oblika energije. Boca ima mali električni kapacitet (do 10^{-8} F) pa može podnijeti veliki električni napon.

Spektroskop (slika 22) – uređaj za promatranje vidljivog spektra svjetlosti. Njime se spektar ne može zabilježiti, može se samo promatrati. Ključni je dio spektroskopa optička rešetka (ili prizma) koja

was invented in the Dutch city of Leiden, from which it takes its name. It was a glass bottle filled with water or mercury and coated with tinfoil (thin silver sheets or tin foil).

Slika 21. **Leidenska boca**
Figure 21. ***Leiden jar***

The first electrical condenser, with its ability to store electrical energy, spurred the development of experiments with electricity, while the powerful spark produced by its discharge hinted at the potential of this new form of energy. The jar has a small electrical capacity (up to 10^{-8} F) and can therefore withstand a high electrical voltage.

Spectroscope (Figure 22) – a device for observing the visible spectrum of light. It cannot record the spectrum; it can only observe it. The key component of the spectroscope is the optical grating (or prism) that disperses the light. It was invented by Gustav Robert Kirchhoff and Robert Wilhelm Bunsen.

Spherical spark (Figure 23) – a device composed of two metal spheres that serve as electrodes separated by an insulator, most often air. One of the oldest methods

razlaže svjetlost. Izumili su ga Gustav Robert Kirchhoff i Robert Wilhelm Bunsen.

Slika 22. **Spektroskop**
Figure 22. ***Spectroscope***

Kuglasto iskrište (slika 23) – uređaj sastavljen od dviju metalnih kugli koje djeluju kao elektrode odvojene izolatorom, najčešće zrakom. Jedna od najstarijih metoda određivanja iznosa visokih napona jest mjerenje kuglastim iskrištem. Napon se mjeri tako da se na niskonaponskoj strani postavi određeni napon. Zatim se kugle sve više približavaju jedna drugoj dok između njih ne preskoči iskra. Iz razmaka kugli u trenutku preskakanja iz odgovarajućih se tablica može iščitati iznos napona.

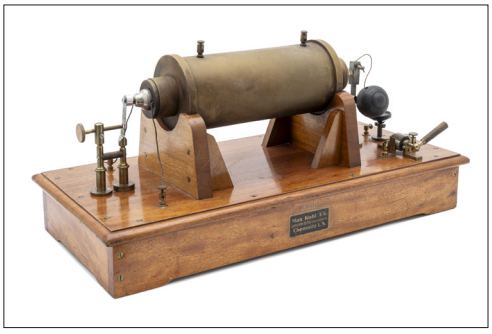
Ruhmkorffov induktor (slika 24), uređaj je namijenjen stvaranju visokonaponskih impulsa iz istosmjernog izvora niskog napona. Koristi se u nastavi za demonstriranje načela elektromagnetske indukcije. Osnovu uređaja čini željezna jezgra oko koje su namotana dva namota bakrene žice koji čine transformator s primarom od desetak do stotinu namota bakrene žice te sekundarom koji ih sadrži do

for determining high voltages is measurement using a spherical spark. The voltage is measured by applying a known voltage to the low-voltage side. The spheres are then gradually brought closer together until a spark jumps between them. The voltage value can be read from a corresponding chart based on the separation of the spheres when the spark jumps.

Slika 23. **Kuglasto iskrište**
Figure 23. ***Spherical spark***

The Ruhmkorff induction coil (Figure 24) is a device designed to generate high-voltage pulses from a low-voltage direct current source. It is used in teaching to demonstrate the principle of electromagnetic induction. The device is based on an iron core around which two coils of copper wire are wound, forming a transformer with a primary of ten to a hundred turns of copper wire and a secondary containing up to a million. School demonstration inductors are smaller and operate at lower secondary voltages. We estimate that the inductor from the collection has several hundred thousand turns including the appropriate thickness of the insulating layers

milijun. Budući da su školski pokazni induktori manjih dimenzija i rade pri nižim sekundarnim naponima, može se procijeniti da induktor iz zbirke ima nekoliko stotina tisuća zavoja uključujući i primjerenu debljinu izolacijskih slojeva kako bi se spriječio električni proboj između navoja visokonaponskog sekundara. Magnetski tok potreban za induciranje napona u sekundarnom namotu stvara se s pomoću vibrirajućeg magnetskog kontakta u krugu primara, koji prekida strujni krug u pravilnim razmacima učestalošću od deset do sto puta u sekundi. Zbog vrlo visokoga prijenosnog omjera transformatora u sekundarnom svitku nastaje napon od nekoliko desetaka do nekoliko stotina kilovolti, dovoljan za stvaranje iskri na iskrištu spojenom na sekundar.



Slika 24. **Ruhmkorffov induktor**
Figure 24. ***Ruhmkorff induction coil***

Savartovo zvono (slika 25), upotrebljava se u nastavi o rezonanciji i titranju stupca zraka. Ime je dobilo po Felixu Savartu (1791. – 1841.) koji se bavio tom tematikom, a **Savartovo zvono** poznatije je po Biot-Savartovu zakonu o jakosti magnetskog polja kao funkciji struje kroz žicu i oblika žice.

to prevent electrical breakdown between the turns of the high-voltage secondary. The magnetic flux required to induce a voltage in the secondary winding is created by a vibrating magnetic contact in the primary circuit, which interrupts the current circuit at regular intervals at a frequency of ten to one hundred times per second. Due to the transformer's very high turns ratio, a voltage of several tens to several hundred kilovolts is generated in the secondary winding, sufficient to create sparks at a spark gap connected to the secondary.

Savart's bell (Figure 25) is used in teaching resonance and the oscillation of a column of air. It is named after Felix Savart (1791-1841) who worked on this topic. The bell is better known for the Biot-Savart law of magnetic field strength as a function of the current through a wire and the shape of the wire.

Slika 25. **Savartovo zvono**
Figure 25. ***Savart's bell***

The bell can be excited by a blow from a soft mallet or by pulling a cello bow well rubbed with rosin. Bringing a hollow tin

Zvono se može pobuditi udarcem mekanoga batića ili povlačenjem gudala za violončelo dobro natrljanoga kolofonijem. Primicanjem šupljega limenoga valjka dolazi do pojačavanja tona koji proizvodi zvono. Neke izvedbe toga uređaja imaju pomično dno šupljeg valjka tako da mu se može mijenjati dubina, dok se kod drugih uređaja dubina šupljine mijenja kliznim tubusom na valjku.

Iskrište u staklenom balonu (slika 26), uređaj je krajem 19. st. služio za demonstraciju preskakanja električkog naboja pri čemu se javlja iskra (bljesak svjetlosti) i pucketanje. Iskrište se spaja na elektrostatički uređaj za razdvajanje naboja. Kugle unutar staklenog balona prikupljaju suprotne naboje koji stvaraju iskru kad preskaču s jedne kugle na drugu.

Slika 26. **Iskrište u staklenom balonu**
Figure 26. ***Sparkler in a glass balloon***

Mali parni stroj (slika 27), toplinski je stroj koji proizvodi mehanički rad kao posljedicu izmjene topline s okolnim tijelima. Od uložene topline veći dio odlazi u hladniji spremnik (okolinu), a manji dio pretvara se u mehanizmu stroja u mehanički rad. Sastoji se od dvaju spremnika topline – topliji (predaje toplinu radnom

cylinder closer increases the pitch of the bell's tone. Some versions of this device have a movable bottom on the hollow cylinder, allowing its depth to be adjusted, while in other devices, the depth of the cavity is changed with a sliding tube on the cylinder.

Spark gap in a glass balloon (Figure 26) was a device used in the late 19th century. It served to demonstrate the jumping of an electric charge resulting in a spark (flash of light) and a crackling sound. The sparkler is connected to an electrostatic device for separating charges. The balls inside the glass balloon collect opposite charges that create a spark when they jump from one ball to another.

A small steam engine (Figure 27) is a heat engine that produces mechanical work as a result of exchanging heat with its surroundings. Of the heat input, most goes to the colder reservoir (the environment), and a smaller portion is converted into mechanical work by the engine's mechanism. It

Slika 27. **Mali parni stroj**
Figure 27. ***Mini steam engine***

sredstvu) i hladniji (okolina u koju odlazi dio topline kroz dimnjak).

Elektrostatički stroj (slika 28) sastavljen je od staklenog diska koji se vrti s pomoću drvene ručke. Uređaj služi za razdvajanje naboja koje nastaje trenjem stakla o kožu. Razdvajanjem naboja postiže se velika razlika potencijala.

Slika 28. **Elektrostatički stroj**
Figure 28. ***Elektrostatic generator***

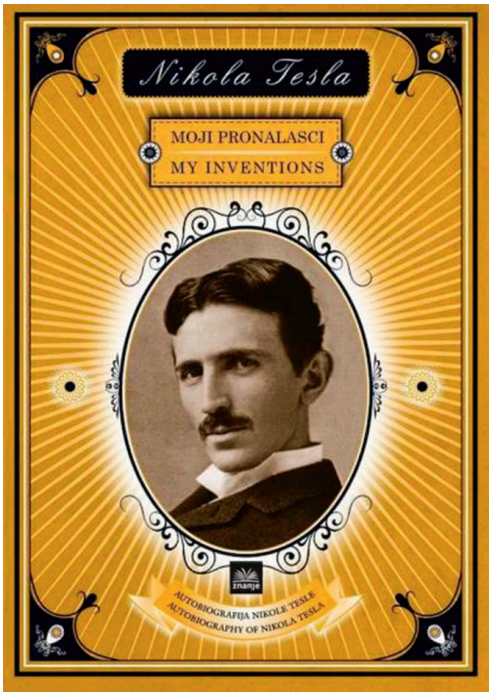
O predavanjima i eksperimentima svoga profesora Martina Sekulića u kabinetu fizike, Nikola Tesla govori u svojoj autobiografiji *Moji pronalasci* (slika 29):

„Pod poticajnim utjecajem profesora fizike, pravog genijalca koji je osnovne fizikalne zakone često demonstrirao aparaturama koje je sam izumio, počeo sam se silno zanimati za elektricitet. Sjećam se da je među njegovim uređajima bila i sprava u obliku staklenog balona omotanog staniolom koji se, spojen na elektrostatički stroj, brzo okretao. Ne mogu vam ni opisati koliko sam bio uzbuđen dok sam pri-

consists of two heat reservoirs – a hot one (which transfers heat to the working fluid) and a cold one (the environment into which a portion of the heat is transferred through the flue).

Elektrostatic generator (Figure 28) consists of a glass disc that is rotated by a wooden handle. The device is used to separate charges generated by the friction of glass against leather. By separating the charges, a large potential difference is achieved.

Nikola Tesla speaks of his professor Martin Sekulić's lectures and experiments in the physics laboratory in his autobiography *My Inventions* (Figure 29):



Slika 29. **Naslovnica autobiografije Nikole Tesle:** ***Moji pronalasci***
Figure 29. ***Cover page of Nikola Tesla's autobiography:*** **My inventions**

sustvovao njegovim demonstracijama tih tajanstvenih pojava. Svaki je dojam u mojem umu proizvodio na tisuće odjeka. Želio sam znati više o toj izvanrednoj sili; žudio sam za pokusima i istraživanjem..." ([11], str. 47).

Teslin profesor fizike Martin Sekulić bio je vrlo svestran čovjek, stoga ne čudi što je mladoga Nikolu Teslu upravo on zainteresirao za fiziku. Osim fizike predavao je još nekoliko predmeta, čak i tjelovježbu. Bavio se humanitarnim radom, vodio fizikalni kabinet i učiteljsku knjižnicu te obnašao dužnost ravnatelja Realke. Objavljivao je znanstvene radove i postao dopisni član tadašnje Jugoslavenske akademije znanosti i umjetnosti (danas Hrvatske akademije znanosti i umjetnosti), a bio je i saborski zastupnik.

Pečat Realke (slika 30) koji se nalazi na unutrašnjoj naslovnoj stranici knjîga svjedoči da su izložene knjige bile u fondu knjižnice Carske i kraljevske velike realke u Rakovcu. Neke od njih danas su dio staroga fonda školske knjižnice Gimnazije Karlovac.

Slika 30. **Pečat Carske i kraljevske velike realke u Rakovcu**

Figure 30. ***The signet of the Imperial and Royal Vocational Grammar School (Realschule) in Rakovac***

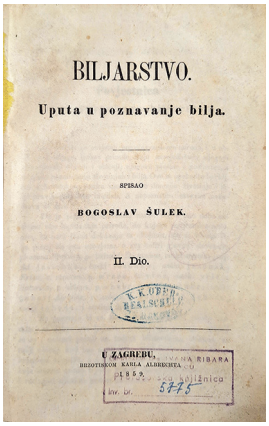
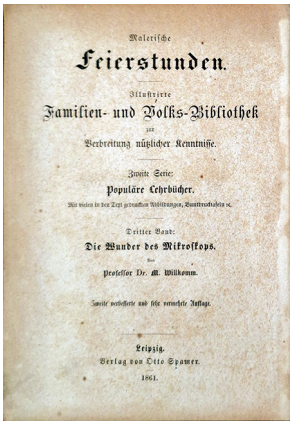
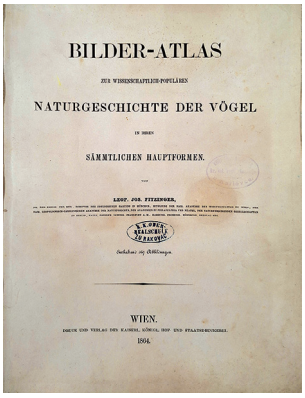
„Under the stimulating influence of the physics professor, a true genius who often demonstrated the fundamental laws of physics with an apparatus he had invented himself, I became intensely interested in electricity. I remember that among his devices was an apparatus in the form of a glass balloon wrapped in tinfoil, which, when connected to an electrostatic machine, would spin rapidly. I can't even describe how excited I was as I witnessed his demonstrations of these mysterious phenomena. Every impression produced thousands of echoes in my mind. I wanted to know more about this extraordinary force; I longed for experiments and exploration..." ([11], p. 47).

Tesla's physics professor, Martin Sekulić, was a very versatile man, so it is no surprise that he was the one who sparked young Nikola Tesla's interest in physics. In addition to physics, he taught several other subjects, even physical education. He was involved in humanitarian work, ran the physics laboratory and the teachers' library, and served as principal of the Realka. He published scientific papers, became an corresponding member of the then Yugoslav Academy of Sciences and Arts (today the Croatian Academy of Sciences and Arts), and also served as a member of parliament.

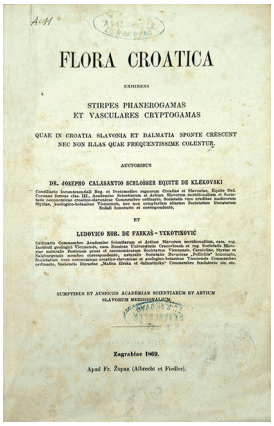
The signet of the *Realka* (Figure 30), located on the inside front cover of the books, attests that the displayed books were part of the collection of the Imperial and Royal Grand Real Gymnasium in Rakovac. Some of them are now part of the old collection of the school library at Karlovac Gymnasium.

Tablica 2. **Knjige izložene u povodu 150. godišnjice mature Nikole Tesle u Velikoj realki**
Table 2. ***Books exhibited on the occasion of the 150th anniversary of Nikola Tesla's graduation from Velika Realka***

Knjige iz biologije i kemije / *Biology and chemistry books*

1. **Šulek, Bogoslav** ***Biljarstvo.*** *Uputa u poznavanje bilja* II. dio Brzotisak Karla Albrechta Zagreb **1859**, 415 str.	
2. **Willkomm, Heinrich Moritz** **Malerische Feierstunden** Illustrirte Familien- und Volksbibliothek zur Verbreitung nützlicher Kenntnisse Zweite Serie Populäre Lehrbücher Dritter Band ***Die Wunder des Mikroskops*** Verlag von Otto Spamer Druck von Giesecke & Devrient Leipzig **1861**, S. 288	
3. **Fitzinger, Jos. Leopold** ***Bilder-Atlas*** *zur Wissenschaftlich-populären* *Naturgeschichte der Vögel in Ihren sämmtlichen* *Hauptformen* Druck und Verlag der Kaiserl. Königl. Hof. und Staatsdruckerei Wien **1864,** erhalted 347 Abbildungen	

4. **Schlosser, Josepho Calasantio equite de Klekovski (Schlosser-Klekovski, Josip Kalasancije)**
Nob de Farkaš-Vukotinović, Ludovico (Farkaš-Vukotinović, Ljudevit pl.)
Flora Croatica
Stirpes phanerogamas et vasculares cryptogamas quae in Croatia, Slavonia et Dalmatia
„Matica ilirska et dalmatinska"
Sumptibus et auspiciis Academiae Scientiarum et Artium Slavorum Meridionalium Zagrabiae
Apud Fr. Župan (Albrecht et Fiedler)
Zagreb
1869, 1 362 p.


FLORA CROATICA

STIRPES PHANEROGAMAS ET VASCULARES CRYPTOGAMAS

QUAE IN CROATIA SLAVONIA ET DALMATIA SPONTE CRESCUNT NEC NON ILLAS QUAE FREQUENTISSIME COLUNTUR

AUCTORIBUS

DR. JOSIPHO CALASANTIO SCHLOSSER EQUITE DE KLEKOVSKI

ET

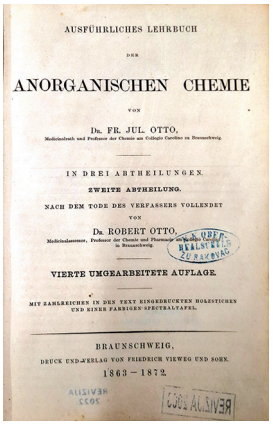
LUDOVICO NOB. DE FARKAŠ-VUKOTINOVIĆ

SUMPTIBUS ET AUSPICIIS ACADEMIAE SCIENTIARUM ET ARTIUM SLAVORUM MERIDIONALIUM

Zagrabiae 1869.

Apud Fr. Župan (Albrecht et Fiedler).

5. **Otto, Friedrich Julius**
Ausführliches Lehrbuch der Anorganischen Chemie
In drei Abteilungen
Druck und Verlag
von Friedrich Vieweg und Sohn
Braunschweig
1863-1872, 1 456 S.


AUSFÜHRLICHES LEHRBUCH

DER

ANORGANISCHEN CHEMIE

VON

Dr. FR. JUL. OTTO,

IN DREI ABTHEILUNGEN.

ZWEITE ABTHEILUNG.

NACH DEM TODE DES VERFASSERS VOLLENDET

VON

Dr. ROBERT OTTO.

VIERTE UMGEARBEITETE AUFLAGE.

MIT ZAHLREICHEN IN DEN TEXT EINGEDRUCKTEN HOLZSTICHEN UND EINER FARBIGEN SPECTRALTAFEL.

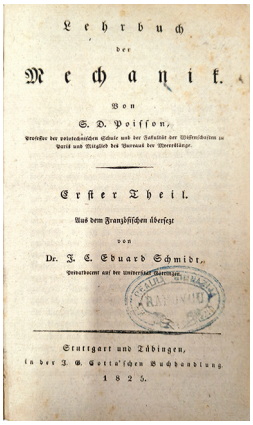
BRAUNSCHWEIG,

DRUCK UND VERLAG VON FRIEDRICH VIEWEG UND SOHN.

1863 – 1872.

Knjige iz fizike, matematike, tehnike i mehanike /
Books on physics, mathematics, engineering and mechanics

6. **Poisson, Siméon-Denis**
Lehrbuch der Mechanik
Erster Theil
Aus dem französischen übersetzt
J. G. Cotta'schen Buchhandlung
Stuttgart und Tübingen
1825, 407 S.


Lehrbuch

der

Mechanik.

Von

S. D. Poisson,

Erster Theil.

Aus dem Französischen übersetzt

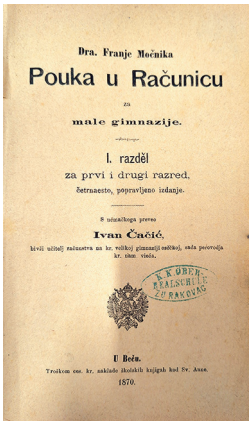
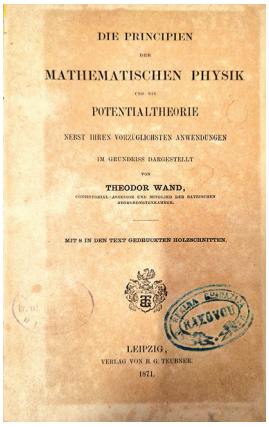
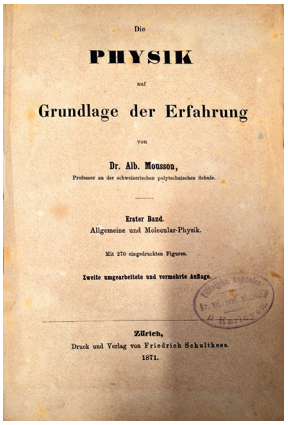
von

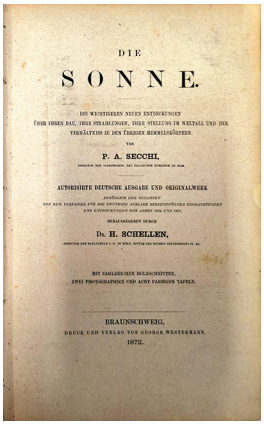
Dr. J. E. Eduard Schmidt,

Stuttgart und Tübingen,

in der J. G. Cotta'schen Buchhandlung.

1825.

7. **Močnik, Franjo** *Pouka u računicu* *za male gimazije* 1. razděl za prvi i drugi razred četrnaesto, popravljeno izdanje Prijevod s njemačkog Ivan Čačić Troškom ces. kr. naklade školskih knjigah kod Sv. Anne, Beč **1870,** 280 str.	
8. **Wand, Theodor** ***Die Principien der mathematischen Physik*** *und die Potentialtheorie: nebst ihren vorzüglichsten* *Anwendungen im Grundriss dargestellt* mit 8 in den Text abgedruckte Holzschnitten Verlag von B. G. Teubner Leipzig **1871,** 184 S.	
9. **Mousson, Albert** ***Die Physik auf Grundlage der Erfahrung*** Erster Band Allgemeine und Molecular-Physik Mit 270 eingedruckten Fguren Zweite umgearbeitete und vermehrte Auflage Druck und Verlag von Friedrich Schulthess Zürich **1871**, 635 S.	

10. **Secci, Pietro Angelo** ***Die Sonne*** Die wichtigeren neuen Entdeckungen über ihren Bau, ihre Strahlungen, ihre Stellung im Weltall und ihr Verhältniss zu den übrigen Himmelskörpern Druck und Verlag von George Westermann Braunschweig **1872**, 852 S.	 DIE SONNE. P. A. SECCHI, AUTORISIRTE DEUTSCHE AUSGABE UND ORIGINALWERK Dr. H. SCHELLEN, BRAUNSCHWEIG, DRUCK UND VERLAG VON GEORGE WESTERMANN. 1872.

Izložene preslike školskih izvješća

Izložene preslike školskih izvješća iz 1873. i 1874. izvor su manje poznatih detalja i podataka iz školskoga života i organizacije nastave (nastavne teme, nastavni plan, popis tema školskih zadaća) u vrijeme školovanja Nikole Tesle.

Propisane teme školskih zadaća u Teslinu 6. razredu školske godine 1871./1872. prikazane su na slici 31 [8].

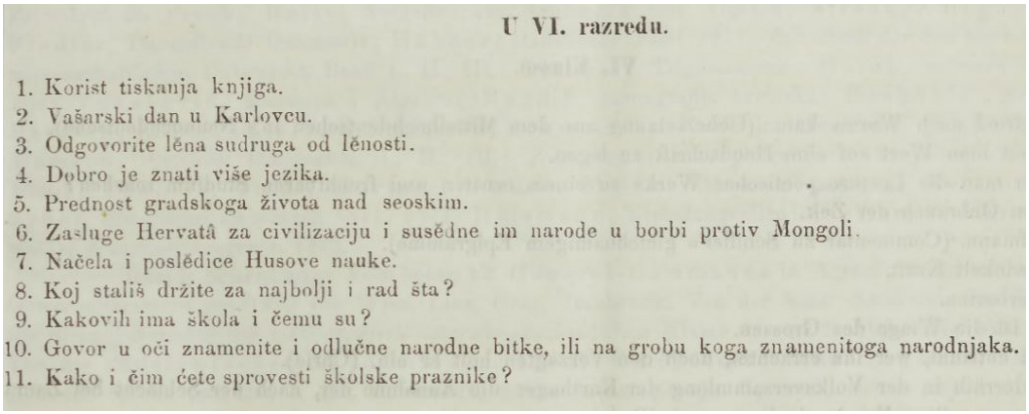
Sljedeće školske godine 1872./1873. teme školskih zadaća u Teslinu 7. razredu prikazane su na slici 32 [8].

Exhibited copies of the school annual reports

The exhibited copies of school reports from 1873 and 1874 are a source of lesser-known details and data about school life and the organization of instruction (subjects taught, curriculum, list of school assignment topics) during Nikola Tesla's time in school.

School assignment topics in Tesla's 6th grade for the 1871/1872 school year show Figure 31 [8].

The following school year, in Tesla's seventh grade for the 1872/1873 school year, the entire topics were covered in Figure 32 [8].



U VI. razredu.

1. Korist tiskanja knjiga.
2. Vašarski dan u Karlovcu.
3. Odgovorite lěna sudruga od lěnosti.
4. Dobro je znati više jezika.
5. Prednost gradskoga života nad seoskim.
6. Zasluge Hervatâ za civilizaciju i susědne im narode u borbi protiv Mongoli.
7. Načela i poslědice Husove nauke.
8. Koj stališ držite za najbolji i rad šta?
9. Kakovih ima škola i čemu su?
10. Govor u oči znamenite i odlučne narodne bitke, ili na grobu koga znamenitoga narodnjaka.
11. Kako i čim ćete sprovesti školske praznike?

1. Korist tiskanja knjiga
1. The benefit of printing books

2. Vašarski dan u Karlovcu
2. A Fair Day in Karlovac

3. Odgovorite lěna sudruga od lěnosti
3. Dissuade the slothful companion of slothfulness

4. Dobro je znati više jezika
4. It's good to know multiple languages

5. Prednost gradskoga života nad seoskim
5. The advantage of city life over country life

6. Zasluge Hervatâ za civilizaciju i susědne im narode u borbi protiv Mongoli
6. The merits of the Croats for civilization and their neighboring peoples in the struggle against the Mongols

7. Načela i poslědice Husove nauke
7. The principles and consequences of Hus's teachings

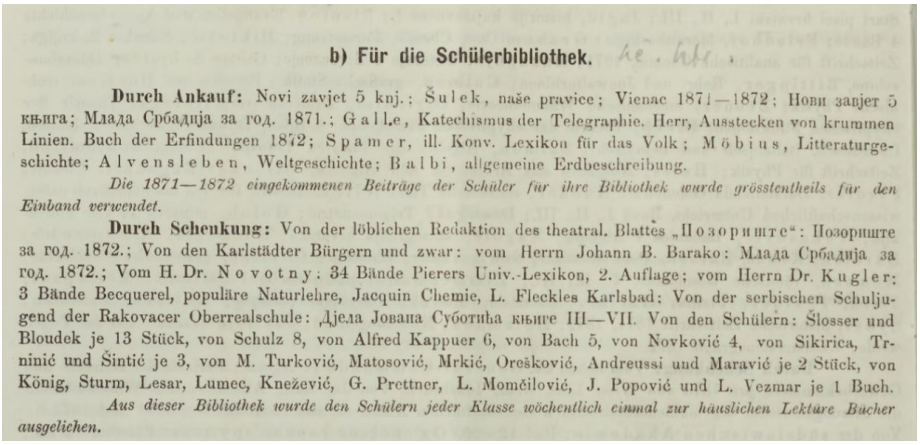
8. Koj stališ držite za najbolji i rad šta?
8. Which class do you consider the best and why?

9. Kakovih ima škola i čemu su?
9. What kinds of schools are there and what are they for?

10. Govor u oči znamenite i odlučne narodne bitke, ili na grobu koga znamenitog narodnjaka
10. A speech at the scene of a famous and decisive national battle, or at the grave of a famous national figure

11. Kako i čim ćete sprovesti školske praznike?
11. How and with what will you spend your school holidays?

Slika 31. **Teme školskih zadaća u Teslinu 6. razredu školske godine 1871./1872.**
Figure 31. ***The subjects of Tesla's school assignments in school year 1871/1872***



b) Für die Schülerbibliothek.

Durch Ankauf: Novi zavjet 5 knj.: Šulek, naše pravice; Vienac 1871—1872; Нови завјет 5 књига; Млада Србадија за год. 1871.; Galle, Katechismus der Telegraphie. Herr, Ausstecken von krummen Linien. Buch der Erfindungen 1872; Spamer, ill. Konv. Lexikon für das Volk; Möbius, Litteraturgeschichte; Alvensleben, Weltgeschichte; Balbi, allgemeine Erdbeschreibung.

Die 1871—1872 eingekommenen Beiträge der Schüler für ihre Bibliothek wurde grösstentheils für den Einband verwendet.

Durch Schenkung: Von der löblichen Redaktion des theatral. Blattes „Позориште": Позориште за год. 1872.; Von den Karlstädter Bürgern und zwar: vom Herrn Johann B. Barako: Млада Србадија за год. 1872.; Vom H. Dr. Novotny: 34 Bände Pierers Univ.-Lexikon, 2. Auflage; vom Herrn Dr. Kugler: 3 Bände Becquerel, populäre Naturlehre, Jacquin Chemie, L. Fleckles Karlsbad: Von der serbischen Schuljugend der Rakovacer Oberrealschule: Дјела Јована Суботића књиге III—VII. Von den Schülern: Šlosser und Bloudek je 13 Stück, von Schulz 8, von Alfred Kappuer 6, von Bach 5, von Novković 4, von Sikirica, Trninić und Šintić je 3, von M. Turković, Matosović, Mrkić, Orešković, Andreussi und Maravić je 2 Stück, von König, Sturm, Lesar, Lumec, Knežević, G. Prettner, L. Momčilović, J. Popović und L. Vezmar je 1 Buch.

Aus dieser Bibliothek wurde den Schülern jeder Klasse wöchentlich einmal zur häuslichen Lektüre Bücher ausgelichen.

1. Kako valja tumačiti izreku: Svět ostaje na mladjih?
1. How should the saying „The world belongs to the young" be interpreted?

2. Korist gimnastike
2. The benefits of gymnastics

3. Prijateljstvo je neprocěnjivo blago
3. Friendship is an invaluable treasure

4. O važnosti Kupe, Korane i Mrěžnice
4. On the importance of the Kupa, Korana, and Mrežnica rivers

5. Zdrav um u zdravu tělu – dvě glavne poluge našemu napredku
5. A healthy mind in a healthy body – the two main levers of our progress

6. Razširenje muhamedanizma u Europi i neke něgove zle poslědice u kulturnom pogledu
6. The spread of Islam in Europe and some of its harmful consequences from a cultural standpoint

7. Znanjem se moći prekrasno okoristiti
7. Knowledge can be wonderfully put to use

8. O koristi željeznica u obće, o koristi karlovačko-rěčke pruge napose
8. On the benefits of railways in general, and of the Karlovac–Rijeka line in particular

9. Zèrno do zèrna pogača, kamen do kamena palača
9. Grain by grain a loaf is made, stone by stone a palace

10. Kojim dostojnimi misli i čustvi treba da završite ovaj sedmi razred?
10. With what worthy thoughts and feelings should you conclude this seventh grade?

Tema ispitne radnje bila je: Priličan osvèrt po našoj književnosti ovoga věka.
The topic of the examination paper was: A considerable overview of our century's literature.

Slika 32. **Teme školskih zadaća u Teslinu 7. razredu školske godine 1872./1873.**
Figure 32. **The subjects of Tesla's school assignments in school year 1872/1873**

ZAKLJUČAK

U Teslino vrijeme realke su pripremale učenike za studij tehnike. Zahvaljujući odličnoj opremljenosti školskih kabineta nastavnim učilima i knjigama te radu poticajnih profesora među kojima se ističe Martin Sekulić, Teslini su interesi usmjereni prema prirodoslovlju, posebice prema fizici. Dvije godine nakon mature Nikola Tesla upisao se na Visoku tehničku školu u Grazu, koju je pohađao kao stipendist komande Vojne krajine, ali nikada nije dovršio svoje formalno znanstveno obrazovanje. Njegova svjedodžba ispita zrelosti, koji je položio u Velikoj realki u Rakovcu, dokument je s kojim je krenuo u svijet znanosti i najviša potvrda o završenom stupnju školovanja.

CONCLUSION

In Tesla's time, real schools prepared students for a degree in engineering. Thanks to the excellent equipment of the school's laboratories with teaching aids and books, and the work of inspiring teachers, among whom Martin Sekulić stands out, Tesla's interests were directed toward the natural sciences, particularly physics. Two years after graduating, Nikola Tesla enrolled at the Graz Institute of Technology, where he studied on a scholarship from the Military Frontier Command, but he never completed his formal scientific education. His certificate of maturity, which he earned at the Velika realka in Rakovac, was the document with which he entered the world of science and the highest credential for completing his schooling.

IZJAVA O SUKOBU INTERESA

Ovaj rad u istom obliku nije objavljen niti ponuđen za objavljivanje nekoj drugoj periodičnoj ili neperiodičnoj publikaciji. Autori izjavljuju da nisu u sukobu interesa.

FINANCIRANJE

Autori za ovaj rad nisu primili nikakva financijska sredstva.

CONFLICT OF INTEREST STATEMENT

This work has not been published in the same form, nor offered for publication in any other periodical or non-periodical publication. The authors declare that they have no conflict of interest.

FUNDING

For this work, the authors did not receive any funding.

LITERATURA I IZVORI / *REFERENCES AND SOURCES*

[1] Milinković A: *Botanika u srednjim školama grada Karlovca od druge polovice XVIII. st. do početka XX. st.*, Vlastita naklada, Karlovac, **2011**, VII+449 str.

[2] Vonić D: Razvoj školstva od 19. st. do početka 20. st., Diplomski rad, Filozofski fakultet Sveučilišta Josipa Jurja Strossmayera u Osijeku, Osijek, 2012., 38. str.
https://repozitorij.ffos.hr/islandora/object/ffos:1663 (Pristupljeno 18. 8. 2023.)

[3] HR – Hrvatski državni arhiv – 904 – Zbirka planova Rakovac, inv. broj 271.

[4] Godišnje izvješće Kralj. velike realne gymnasije u Rakovcu u Hrvatskoj za šk. god. 1882/3. (Pristupljeno 25. 9. 2023.)

[5] https://gospic.hr/uciteljski-studij/ (Pristupljeno 2. 10. 2023.)

[6] Sedmo godišnje izvješće Carske i kraljevske velike realke u Rakovcu u hrvatsko-slavonskoj Vojnoj krajini za školsku godinu 1871/2.

https://www.gimnazijakarlovac.hr/pdf/?file=ZhanCLd9L21lZGlhL2NvbV9kaWdiYXN0aW5hL2RhdGEvaXp2amVzY2EvcmVhbGthLzE4NzEtMTg3Mi5wZGY=jCd7VWR8 (Pristupljeno 2. 10. 2023.)

[7] Prirodoslovna zbirka Gimnazije Karlovac.

[8] Osmo godišnje izvješće Carske i kraljevske velike realke u Rakovcu u hrvatsko-slavonskoj Vojnoj krajini za šk. god. 1872/3. i 1873/4.

https://www.gimnazijakarlovac.hr/pdf/?file=ZhanCLd9L21lZGlhL2NvbV9kaWdiYXN0aW5hL2RhdGEvaXp2amVzY2EvcmVhbGthLzE4NzItMTg3NC5wZGY=jCd7VWR8 (Pristupljeno 2. 10. 2023.)

[9] Arhiva Gimnazije Karlovac.

[10] Izložbeni postav Gimnazije Karlovac povodom 150. obljetnice mature Nikole Tesle u Karlovcu.

[11] Tesla N: *Moji pronalasci. Autobiografija Nikole Tesle / My Inventions. Autobiography of Nikola Tesla* (pripremio Detela A.), Znanje, Zagreb, **2015**, 156 str.