

Serbian Mathematics Culture of the 19th century

Nikos Kastanis, Snezana Lawrence

Background

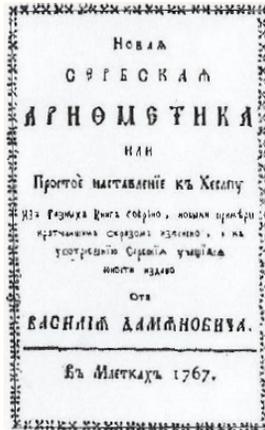
Serbia, in the heart of the Balkans, has since the 14th century been de-facto a divided country, most of which was under the rule of the Ottoman Empire, but whose northern parts had been under the rule and influence of the Hungarians, and later Austro-Hungarian Empire.

Serbian mathematics education had also developed under these two main spheres of influence but also having Serbian Orthodox Priests as a driving force behind the somewhat late coming of Enlightenment to this geographic area. In the north (Vojvodina) educational institutions had developed under the influence and through the support of the Austro-Hungarian Empire, and in Serbia proper (mainly in Belgrade and Kragujevac) they developed despite the Ottoman influence and amid the striving for independence by the Serbs.



The beginnings, 1717-1863

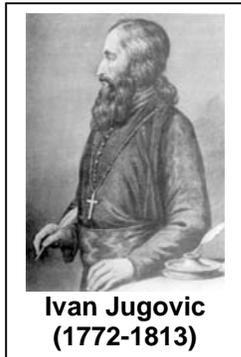
Although the first primary school in Vojvodina (northern part of Serbia) was opened in 1717 in Sombor, no books on mathematics appeared until Vasilije Damjanovic (1734-1792) published in 1767 *Nova Serbskaja Aritmetika (The New Serbian Arithmetic)*, which was at the same time the first book on mathematics, published in Serbian language.



By 1800 there were two elementary schools in Belgrade, but the First Serbian Uprising against the Ottomans (1804-1813) led to the foundation of many more such schools throughout Serbia proper, and the founding of the first Great (equivalent to High) School of Belgrade in 1808.

By this time, the first teacher training school (*Norma*) was already functioning in Sombor (Vojvodina). *Norma* was founded in 1778 by Avram Mrazovic (1756-1826), son of a Serbian Orthodox priest educated in Pesta and Vienna. Maria Teresa (1717-1780), Austro-Hungarian Empress, nominated Mrazovic as the chief of the developing educational institutions in Sombor, which was at the time the seat of Serbian culture in the north.

In Serbia proper the Great School of Belgrade was led by Ivan Jugovic, (1772-1813) one of the most educated Serbs at the time, who was also the school's first teacher. Jugovic was a protégé of Dositej Obradovic (1742-1811) the first Serbian writer, and the teacher of the son of Karadjordje (1762-1817) who led the First Uprising in 1804.



**Ivan Jugovic
(1772-1813)**

The requirements for enrolment in the High School were a knowledge of reading, writing, and some arithmetic. According to Jugovic's plan, the education in the Great School was to last for three years and the following subjects were studied: general history, general geography with drawing, statistics, mathematics, composition, German language, common prayers, state and criminal law, moral instruction, church singing, fencing, and training with rifles. Jugovic taught mathematics and was apparently a skilful mathematics teacher, especially in fractions.

After the collapse of the first uprising in 1813, Turkish rule was re-established over Serbia proper and most of the schools were closed. In northern Serbia however, the above described developments continued, with *Norma* working throughout this period.

In 1829 Russia forced the Treaty of Adrianople upon the Ottoman sultan, who had to grant Serbian autonomy under the pressure from the Russians, and to recognise Milos Obrenovic (1780-1860) as hereditary prince. Except for garrisons in Belgrade and other fortresses, the Turks evacuated Serbia. In two Sultan's *Hatt-I-Sherif* (the sultan's solemn decess which were implemented first in 1830 for Belgrade and then in 1833 expanding the same rights to the rest of the country), Serbia was proclaimed a suzerain principality with Milos Obrenovic as hereditary prince. A Metropolitante of Serbia was established in Belgrade, autonomous from the Patriarch of Constantinople. Russia's status as the guarantor of Serbia's autonomy was also recognised by this document.

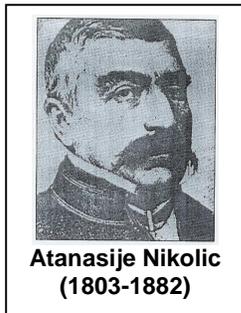
Prior to 1830 Serbia had 16 town schools and several village schools. In the period from 1835 to 1836, 26 elementary schools were opened at the state expense. The Great School of Belgrade, being closed in 1813, was reopened in 1830. Report from 1833 indicates that the school was developing after the 'gymnasium' model, although at this time it still had only one teacher. In 1833

the school was transferred to Kragujevac, where in 1835 it was further modelled into a gymnasium having gained four grades and four teachers, and offering mathematics as a subject in the first three grades.

Some of the teachers in all of these schools were educated in Norma in Sombor, but a new teacher training college was needed for wider and more organised education of teachers in Serbia proper. For a short while, from December 1837 to June 1838, a Military Academy operated initially in Pozarevac, then Belgrade and finally Kragujevac. Stefan Krkalovic, a former officer in the Austro-Hungarian army, was its director and teacher of advanced mathematics. This marked the first reference to advanced mathematics in the history of Serbian culture, and is significant as marking of a triumph of Austro-Hungarian influence over the cultural strife and educational developments that began almost a century earlier.

The first Serbian Military Academy was short lived. It is not known whether this was a result of a Turkish objection; nevertheless it led to the founding of the first Lyceum in 1838 in Kragujevac, which marked the beginning of the undergraduate study of mathematics in Serbia. The first curriculum for the Lyceum included philosophy, general history, mathematics, natural law, European statistics, drawing, German, French, and the Bible studies. The first teacher of mathematics and the first rector of Lyceum was Atanasije Nikolic, who studied in Austro-Hungarian town of Dur (where he studied philosophy), Vienna (where he studied artillery) and Pesta (engineering).

Atanasije Nikolic was a prolific author and an energetic leader of educational reform. While studying philosophy in Dur, Nikolic fell in love with mathematics but did not have the means to further finance his studies. A father of one of his pupils who he tutored privately advised him that he would learn 'a lot of mathematics' if he enrolled in a military academy in Vienna, which is what he ended up doing. This eventually led him to finish engineering course in Pesta, which he completed in 1829. Nikolic had a number of successful engineering projects in Vojvodina and in 1838 was given a first chair of mathematics at the Lyceum. His first task was to write a textbook for the students, which he ardently set about doing, trying to translate mathematical terminology from Latin into vernacular Serbian.



Nikolic's books became the first textbooks for teaching undergraduate mathematics in Serbia. The first one was *Algebra* published in 1839, and the second *Elementary geometry*, published in 1841.

In the next few decades the Serbian educational system and its handling of mathematics teaching were developing steadily. A law, which was brought in 1844, proscribed the organizational structure of the educational system, along with the framework for its syllabus. It proscribed that a lower gymnasium was to have four grades with four professors and that gymnasium was to have six grades. Mathematics was taught at every stage of the lower and first four years of the gymnasium. Fifth and sixth grade of gymnasium were also to have algebra among other subjects. In 1853 the first statutes of the Lyceum were published, bringing about many changes in the curriculum. Greater emphasis was then placed on the natural sciences by the introduction of physics and by the expansion of the teaching of mathematics, apart from arithmetic and algebra, to include geometry and trigonometry.

It is interesting to note that at this time a new Artillery School was established in Belgrade (around 1850). Mathematical education here was enriched to include not only mathematics (arithmetic and algebra) and geometry but also descriptive geometry. From there on things started to move pretty swiftly. In 1863 the Lyceum became the Superior School, and by 1865 Serbia possessed two classical Gymnasia, four lower Gymnasia and a secondary school for girls. Ten years later *Realshulen* or technical schools began to be established throughout the country.

1863-1873

In the 1863-1873 period natural sciences and mathematics were studied within the framework of the Faculty of Engineering of the Superior School. At the end of this decade however, the Faculty of Philosophy got a new section – Science and Mathematics, and so mathematics was once again taught in the Faculty of Philosophy. During the same decade Serbia was granted independence from the Ottomans and the international recognition (1878).

This marks a major turning point for mathematics education in Serbia. At the time there was yet no prescribed qualification of mathematics teacher (at any level) but a hierarchy of teaching mathematics begins to establish itself throughout the growing educational system.

When in 1873 the Lyceum became Superior School, Dimitrije Nestic was its professor of



**Dimitrije Nestic
(1836-1904)**

Mathematics. Nestic finished lower gymnasium and gymnasium in Belgrade and attended the Lyceum for two years between 1853 and 1855. He went to continue his studies in mathematics at Vienna Polytechnic between 1855 and 1858 and then Karlsruhe Polytechnic from 1858 to 1861. Nestic is famous for introducing the metric system to Serbia in 1873. He was a friend of Vuk Karadjic (1787-1864), the well-known Serbian linguist, writer, and educator during the first half of the 19th century, while he studied in Vienna 1855-1858, and so Nestic accordingly continued a tradition of trying to define and apply Serbian terminology to every and all mathematical concepts and processes.

Nestic taught lower and higher mathematics on various courses at the Superior School, which were attended by both students of the faculties of Philosophy and Technics. He wrote three textbooks for his courses:

Trigonometry (1875), *Science of combinations* (1883) and *Algebraic Analysis I and II* (1883).

Another of the prominent Serbian mathematical educators from this period was Emilijan Josimovic (1823-1897). Josimovic studied at Vienna Polytechnic and became professor of the Belgrade Lyceum in 1845 and then professor of the Artillery School in 1854. In 1869 he became professor of the Superior School and a rector of the same in 1874.

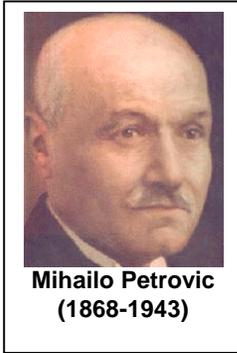
Josimovic published one of the first textbooks for the students of higher mathematics in Serbia, *Principles of Higher Mathematics* (1858). Apart from having extremely successful career as professor of mathematics at the Superior School, Josimovic was also important for his work on translating the principles of Descriptive Geometry into Serbian language, and publishing a textbook for mathematics, architectural and engineering students *Principles of descriptive geometry and perspective* in 1874.

1873-1894

Nestic and Josimovic's example of being educated in the universities and schools outside of the country and coming back to teach at the Superior School and later the University of Belgrade continued for some time. First was Dimitrije Danic (1862-1932) who received his PhD in mathematics from the University of Jena in 1885 with a thesis on *Conforme Abbildung des elliptischen Paraboloids auf die Ebene*. Upon his return to Serbia he became a professor of mathematics at the Military Academy in Belgrade.

Bogdan Gavrilovic (1864-1947) similarly received his PhD in 1887 from the University of Budapest. His thesis was on *Construction of one-valued analytic functions*. He began his university career in Belgrade immediately upon his return from Budapest.

From 1893 mathematics syllabus at the Superior School developed to such a degree to contain more than mere algebra and geometry as it did at the beginning of the 1840s. It consisted of four years of learning, having subjects such as lower mathematics, higher mathematics, descriptive geometry, logic, history of philosophy, and rational mechanics.



In 1894, one of the most prominent Serbian mathematicians of all times, Mihailo Petrovic Alas, came back from having successfully completed his studies in Paris. He was born to a well-to-do family in Belgrade, where he finished the primary and secondary schooling. He completed a degree in natural sciences (mathematics) at the Superior School in 1889. The same year he went to Paris where, after a year of perfecting the language, he passed the entrance examination to the École Normale Supérieure, and where he stayed until 1894. During that time, he was awarded at the Faculty of Sciences in Paris, a mathematical 'licence' (1892), 'licence' in physics (1893), and the doctorate in mathematics 1894. Petrovic's thesis was entitled *Sur les zéros et les infinis des intégrales des équations différentielles algébriques* (Paris, 1894). The examining commission consisted of Hermite, Picard and Painlevé.

Upon his return to Belgrade in 1894, Petrovic received a professorship at the Superior School. At the beginning of 1905, the School was discontinued and the University of Belgrade was founded with eight professorships, Petrovic having been appointed to the Chair in Mathematics. He remained in that position until his death in 1943.

Petrovic brought French influence to a territory, which until then knew mostly only of Austro-Hungarian and German mathematics. Although he was not the first doctoral student who studied mathematics in France, he certainly became the most influential one upon his return to the country.

By the end of the 19th century therefore, not only did Serbia become more unified culturally and educationally, but also the sphere of influence moved from Austro-Hungarian and Germanic to French intellectual and political circles.

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