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MIHAILO PETROVIĆ'S EDUCATION IN FRANCE AND ITS SIGNIFICANCE IN ESTABLISHING THE PETROVIĆ SCHOOL OF MATHEMATICS

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Abstract. — Mihailo Petrović, the founder of the first school of mathematics in Serbia, was one of the first foreigners to be chosen as an "internal student" ("élève interne") at the prestigious École normale supérieure in France. After graduation, he decided to stay in Paris and complete his doctoral thesis on differential equations entitled "Sur les zéros et les infinis des intégrales des équations différentielles algébriques," defended on June 21, 1894 at the University of Paris before the examination committee composed of Charles Hermite, Émile Picard and Paul Painlevé. He thus became one of the first six doctors of mathematical sciences in Serbia. This paper looks into Petrović's education at the École Normale Supérieure in Paris and the influence of his professors on his academic work. Also, this paper focuses on how Petrović brought the spirit of modern European mathematics to Serbia and set the direction of the development of mathematics in Serbia based on the model of French mathematics.

Résumé. — Mihailo Petrović, le fondateur de la première École de mathématiques en Serbie, a été l'un des premiers étrangers à être choisi comme élève interne à la prestigieuse École normale supérieure. Après y avoir achevé

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ses études, il a décidé de rester à Paris et de terminer une thèse de doctorat sur les équations différentielles intitulée « Sur les zéros et les infinis des intégrales des équations différentielles algébriques », soutenue le 21 juin 1894 à l'université de Paris devant un jury composé de Charles Hermite, d'Émile Picard et de Paul Painlevé. Il est ainsi devenu l'un des six docteurs en sciences mathématiques de Serbie. Cet article s'intéresse à la formation de Petrović à l'École normale supérieure de Paris et à l'influence de ses professeurs sur son travail académique. Cet article se concentre aussi sur la manière dont Petrović a apporté l'esprit des mathématiques modernes européennes en Serbie et y a mis en place les grandes lignes du développement des mathématiques, sur le modèle des mathématiques françaises.

1. INTRODUCTION

Understanding the influence of French mathematics on the development of mathematics in Serbia in the late 19th and early 20th centuries, requires taking a look back at the period that preceded it, and at the development of higher and academic education in mathematics among the Serbs.

In the early 19th century, the territory of today's Serbia was divided between two empires: the area north of the Danube was under the rule of the Austrian Empire, while south of the Danube was ruled by the Ottoman Empire. After the struggles for national liberation (1804–1813 and 1815–1817) and the conclusion of the Adriatic Peace (1829), Serbia became a vassal principality and was granted the right to full internal self-government, according to the edicts (hatisherifs) signed by the Ottoman Sultan Mahmud II. These "legal and constitutive acts" represented an important step towards the constitution of full autonomy of the Principality of Serbia from the Ottoman Empire [Ljušić 1986, p. 113]. The edicts guaranteed freedom of religion, trade and the right to maintain an army, as well as the right to establish courts, schools, hospitals and other administrative institutions. Importantly, they created conditions to do further work on organizing higher education in Serbia. Initial steps in this direction were taken during the struggle for national liberation, and in 1838 the Lyceum of the Principality of Serbia was founded, the first institution of organized higher education in Serbia [Jordanović 2018, pp. 27–30]. [1]

[1] The Lyceum (Liceum Knjažestva serbskog) extended the grammar school (gymnasium) education in Serbia from four to six and then to seven years, and its main goal was to prepare students for civil service in Serbia or further education abroad [Rajić & Leovac 2018, p. 396]. The formal requirement for enrollment was passing the grammar school graduation, and only boys had the opportunity to attend grammar schools [Trgovčević-Mitrović 2003, p. 83]. In the two-and-a-half decades of its existence, 1205 students enrolled in the Lyceum, and 238 graduated, many of whom later

This event created an important momentum towards building national intelligentsia and the state, and substantially contributed to setting the foundations of the country's modernization [Trgovčević 2003, p. 33]. It also marked the beginning of the mathematics that could be "described as Serbian" [Jevtić-Novaković & Lawrence 2019, p. 280].

The first professors of mathematics at the Lyceum, which later on evolved into the Great School in Belgrade (1863) and subsequently into the University of Belgrade (1905), were mostly educated Serbs who had graduated from the schools of law and technical schools in the Austrian Empire [Trifunović & Perišić 1997, p. 7; Jevtić-Novaković & Lawrence 2019, p. 283] (Table 1).[2] Being primarily interested in applied mathematics, especially the area of engineering, and descriptive geometry, they laid the foundations of the higher and academic mathematics education in Serbia [Jevtić-Novaković & Lawrence 2019, p. 293]. For instance, they

became students at European universities [Đorđević 1963, p. 7]. In 1863, the Lyceum grew into a Great School in Belgrade (Velika škola), which, in addition to the need to educate civil servants, also strived to educate academic and scientific staff [Jordanović 2018, p. 31]. It had three faculties: Philosophy with three years of studies (until 1880, when it was changed to four years), Engineering and Law with four years of studies [Đorđević 1963, p. 8]. It presented a transitional form between a grammar school and a university because there were two significant obstacles to receiving the title of a university officially—the first one concerned its autonomy (it was under the supervision of the Ministry of Education; the Government directly interfered in the selection and appointment of rectors and professors, as well as in other school activities [Krnjaić-Cekić 2022, p. 22]), and the second was that this institution could not issue the doctoral degree certificates [Andrić 2021]. Like Lyceum, the formal requirement for enrollment in Great School was passing the grammar school graduation, and usually, boys had the opportunity to enroll. However, there was a case where the Great School accepted a girl who graduated from the girl's high school as a part-time student in 1871 [Trgovčević-Mitrović 2003, p. 84]. Also, since 1879, girls could request to attend grammar schools. Still, they had to receive approval from the Minister of Education and the directors of the grammar schools, who were reluctant to do so [Rajić & Leovac 2018, p. 399]. The first female full-time students of the Great School were enrolled in 1887 [Knežević Lukić & Vasojević 2021, p. 219]. Finally, with the introduction of the parliamentary system and democracy in Serbia, the conditions were met for the Great School to evolve into the University of Belgrade in 1905 [Đorđević 1963, p. 13].

[2] After the Ottoman part of Serbia became a vassal principality, the area north of the Danube remained under the rule of Habsburgs and the Austrian Empire until 1918. Therefore, the first generation of mathematics professors at the Lyceum—Petar Radovanović, Konstantin Branković, Atanasije Nikolić, Simeon Prica, Emilijan Josimović and Filip Hristović—were Serbs born, raised, and educated in the Austrian Empire. Before starting university, some graduated from Serbian high schools in the Austrian Empire; for example, Konstantin Branković graduated from Novi Sad Grammar School [Aćimović 2010, p. 55], and Atanasije Nikolić graduated from Karlovci Grammar School [Jovanović 2001, p. 116].

wrote the first university mathematical textbooks (i.e., on arithmetic, algebra and geometry) in the Serbian language. The importance of that was that, unlike the Serbian high schools in the Austrian Empire, the schools in the Principality of Serbia used the Serbian language instead of Latin as their teaching language [Jovanović 2001, p. 119]. It is beyond doubt that they encountered a multitude of challenges in terms of determining suitable Serbian translations for scientific and technical terms. For example, Atanasije Nikolić, an engineer educated in Pest, today's Hungary, and a mathematics professor at the Lyceum, wrote the first algebra textbook for the Lyceum students, and as part of this process, translated technical terms into Serbian, formulating algebra symbols in the Cyrillic script [Sarić & Sarić 2001, p. 8]. [3] To resolve this "peculiar Serbian linguistic situation" professors of the Lyceum founded a scientific society entitled the Society of Serbian Literature (1841), the forerunner of today's Serbian Academy of Sciences and Arts [Ćirković 2016, p. 22]. [4] In the beginning, the main task of this society was to improve the language of the Serbian people and build terminology, as a prerequisite for the spread and success of the sciences taught at the Lyceum [Society of Serbian Literacy 1847, p. 1; Ćirković 2016, p. 17]. [5] Also, to spread mathematics and related sciences, professors of the Lyceum established a university mathematics library and acquired foreign publications to make international scientific discoveries and achievements available to both the teachers and students in Serbia [Trifunović & Perišić 1997, p. 11; Nikolić 2017, p. 2]. Furthermore, aside from their work in education and pedagogy, they also conducted pioneering scientific research work in the territory of Serbia, and their scientific

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3 See [Nikolić 1839].

4 In the first half of the 19th century, the official language of the Principality of Serbia was the Slavic-Serbian language, written in Cyrillic. This hybrid literary language contained elements of the Serbian vernacular, Russo-Slavic, Serbo-Slavic languages, and Russian literary language [Kecman & Ćećez Iljukić 2021]. However, since the Slavic-Serbian did not have a standardized grammar, dictionary, or spelling, which led to various inconsistencies, from the 19th century onwards, the circles of educated Serbs started investing efforts towards reforming the Serbian language. This resulted in a gradual suppression of the Slavic-Serbian language from use and the official adoption of the Serbian vernacular (the "Vuk's") language as the literary language in 1868.

5 In the 19th century, the need to improve and use a native language in culture and science also appeared among other nations as part of their national awakening. For example, the Czechs in the Habsburg Monarchy, in addition to the official German language, which was the language of the social and cultural elite, initiated the use of the Czech language and the development of Czech science and culture [Nový 1996, p. 502]. Also, the Poles, whose territory was divided between Russia, Austria, and Prussia, strived for a "national revival that also embraced science" by establishing scientific institutes and journals in their native language [Duda 1996, p. 481].

results were published mainly in domestic publications.[6] It should be noted that when publishing textbooks and scientific works, they rarely cited the sources they used, but it is assumed that there was a strong influence of the German and French mathematicians in the scientific literature [Jevtić-Novaković & Lawrence 2019, pp. 292–293].

However, the pedagogical and scientific work of these first professors of mathematics was often interrupted owing to their involvement in other state affairs, as the young Serbian nation-state needed educated people and their engagement in the state administration. Employed mainly as government advisers and emissaries, they took part in various diplomatic missions or gave a helping hand in modernizing the economy. Thus, Emilijan Josimović, an alumnus of the Royal and Imperial Polytechnic Institute in Vienna and a professor of higher mathematics and descriptive geometry at the Lyceum and the Artillery School, designed a new plan for the spatial arrangement of the Serbian capital Belgrade, seeking to liberate the city of its past, which harked back to the period of the Ottoman rule, and orient it towards becoming a modern European city [Vuksanović-Macura 2018, p. 143].[7] Also, Dimitrije Nešić, a graduate student of the polytechnic schools in Vienna and Karlsruhe, professor of mathematics at the Lyceum and the Great School, and a Minister of Education, was dispatched on a mission to the Central European countries—Vienna, Würzburg, Cologne and Brussels—to meet and consult with the experts on the units of measurement, and compile a draft law on introducing the decimal-based metric system in Serbia [Petković & Jovanović 1998, p. 10].[8] Finally, Dimitrije Stojanović, a graduate of the Royal and Imperial Polytechnic Institute in Vienna, professor of descriptive geometry at the Great School, Minister of Construction, and Minister of Finance, took part in the preparations for constructing the first railway in Serbia [Mićić & Simić 1996, p. 344].

This constant state of being torn between academic, public and political life, also affected the development and popularization of the mathematical sciences in Serbia. For instance, the total number of mathematics professors who were employed at the Lyceum—later on, the Great School—in

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6 They published mainly in the Serbian language in the journals of the Serbian Academy—"Гласник Српског ученог друштва" ("Serbian Learned Society Gazette"), later "Глас Српске краљевске академије" ("Serbian Royal Academy Gazette")—as well as in the journals "Nastavnik," "Prosvetni glasnik," "Srpski književni glasnik," "Delo" and "Misao" [Trifunović 1969, p. 294].

7 See [Josimović 1867].

8 See [Nešić 1874].