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250 years in the service of the Fatherland: Empress Catherine II Saint Petersburg Mining University in facts and figures

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Abstract. In 2023, Empress Catherine II Saint Petersburg Mining University – the first higher technical educational institution in Russia – turns 250 years. Any significant anniversary is an occasion to look back, analyze and evaluate the way traveled. The article analyzes the main achievements of the Mining University on the basis of statistical material from the moment of the foundation of the Mining School to the present day: educational and pedagogical experience in the education and training of mining specialists, scientific and technical intelligentsia; the outstanding contribution of its scientists, graduates to the establishment and development of the mineral resource complex of Russia, in strengthening the country's defense power, the creation of scientific schools. The first part of the article provides data on the number of graduates for different periods of the history of the university, shows the dynamics of their number growth, the peculiarities of learning. According to the authors, over 250 years, about 99 thousand engineers and mining specialists have been prepared in the university. The second part of the article is devoted to the characteristics of the teaching staff, in which a special place is occupied by his favorites, who have become outstanding scientists, academicians and corresponding members of the Academies of Sciences. Those of them who have devoted more than a dozen years of their lives to teaching within the walls of the university are noted. The final part shows the main scientific achievements of the university: the organization of scientific societies, the development of scientific schools, research institutes, etc. About 200 graduates of the Mining University have been awarded State Prizes for their contribution to the development of science and technology. The work of dissertation councils was noted, in which more than 5 thousand dissertations have been defended since 1943.

Keywords: Mining University; mining; graduates; teachers; mining engineer; scientists; academicians; prize winners; scientific schools; dissertations

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Introduction. On November 1 (October 21, under the Julian calendar) 1773, Empress Catherine II Highly approved the report of the Senate "On the establishment of a Mining School at the Berg-Collegium", which, in view of the "vastness of the Russian Empire, which contains a lot of metal ores," will be "not only necessary for the State, but also very useful" [1, p. 837-843]. From that moment, the countdown of the history of the Empress Catherine II Saint Petersburg Mining University, the first higher technical educational institution in Russia, began. It was founded 16 years later than the Kongsberg Mining School in Norway (1757) and only 7 years later than the Freiberg Mining Academy in Germany (1765) and is thus one of the oldest mining technical educational institutions in the world.

During its rich history, Empress Catherine II Saint Petersburg Mining University has repeatedly changed its name and structure, but its role as a leading educational institution, the main forge of personnel for the mineral resource complex of our country, the scientific center for the development of the mining industry remained unchanged. Until 1899, when the Ekaterinoslavskoye Higher Mining School was founded, Mining University was the only mining technical university in Russia.

Evidence of the special role of the Mining University in the history of the formation and development of the mineral resource complex of the country is that throughout the imperial period

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of the history of Russia, it was subordinate to the most important state institutions: the Berg-Collegium (1773-1783, 1796-1806), the Saint Petersburg Treasury Chamber (1783), the Cabinet of His Imperial Majesty (1784-1796), Mining Department (since 1811 – Department of Mining and Salt Affairs) under the Ministry of Finance (1806-1873), the Mining Department under the Ministry of State Property (since 1894 – the Ministry of Agriculture and State Property) (1773-1917). The history of Empress Catherine II Saint Petersburg Mining University is inextricably linked with the history of our country. The pages of its chronicle reflect the heroic and tragic events of the past of the Russian Empire and the USSR.

An anniversary is always an occasion to remember the past, look back and analyze the path traveled, determine plans for the future. The path traversed by the Mining University is, first of all, the educational process and the training of highly qualified specialists, mining engineers who are able to professionally solve the problems of the development of the mineral resource complex of the country; scientific activity, the formation of scientific institutes and schools known far beyond the borders of Russia. A special pride of the Mining University is its scientific and teaching staff.

The authors did not aim to cover all aspects of the Mining University, focusing on three of them – education, teaching staff of the University and its scientific achievements.

Let us trace and evaluate the scale and uniqueness of the path traversed by the Mining University over two and a half centuries, relying on statistics that helps to understand the state of affairs, and which can be safely attributed to the number of effective tools of learning and control.

Sources and historiography. The history of the Mining University is widely covered in the scientific literature. However, only two publications contain detailed reference and statistical information and both editions are dedicated to the 150th anniversary of the Mining Institute [2, 3]. The special issue of the Mining Journal (1923, N 11), in addition to a brief history of the life of the Institute, contains lists of graduates of the Mining Institute from its foundation to 1923 inclusive; lists of the commanding and teaching staff, as well as brief historical sketches of the museum and library of the Mining Institute for 150 years. This anniversary was celebrated in 1926, and the same year the "Jubilee Volume" was published, in which the authors, in addition to describing the social composition of the student and the teachers, provided information about general and special disciplines, as well as the history of some departments. Other works, including anniversary publications dedicated to the Mining Institute, contain various statistical information, but they are not systematized, and do not give a complete picture of the Institute's past. Valuable information about outstanding scientists who worked in Mining Institute is contained in reference and biographical publications [4-6].

The main body of statistical information is stored in archival funds. The work of a historian is a painstaking search and analysis of facts extracted from various sources. The archives of the Mining University, the Central State Archive of Saint Petersburg, the Central State Historical Archive of Saint Petersburg, the Central State Archive of Historical and Political Documents of Saint Petersburg keep in their collections a lot of valuable information about the past of the Mining University. There are dry reports filled with figures and numbers, and minutes of party meetings and meetings of Academic Councils, verbatim reports, etc., in which the voices of prominent figures, scientists and teachers of the Mining University seem to come to life. Some important information had to be collected bit by bit, counted, checked with other sources. Even more valuable is the information that is brought together for the first time and presented in a generalized form in this study.

When working on the article, the authors were guided by two main methodological principles of comprehension of the past – objectivity and historicism.

Students and graduates of Saint Petersburg Mining University. In December 1773, the first director of the Mining School, M.F.Soymonov, selected 19 students from Moscow University to study at the Mining School. After reviewing the list of students of the Yekaterinburg Mining School, the director of the Mining School took five more children of mining officers to continue their studies there. In general, when the opening of the school followed on June 28, 1774, 24 students on state support, 8 people on their own and 7 people "privately studying" began studying there [7, p. 74]. The

youngest was 13 years old, the oldest was 23 years old [3, p. 26]. 20 years later, in 1793 the number of students of the school has grown to 115-126 people [8, Op. 1. D. 30. L. 1-4].

The first graduation of the Mining School took place in 1776. Unfortunately, the complete lists of those who graduated from the Mining School from 1776 to 1804 have not been preserved. The names of 116 graduates who received during this period the title, according to the Charter of 1774, of Shichtmeister of the XIII-XIV classes and, in rare cases, even a Berg-Geschworen of the XII class[1] [2, p. 748] are known. According to the Jubilee Commission of 1923, about 300 people graduated from the Mining School in the first 30 years [2, p. 657].

In January 1804, the Mining School was transformed into a Mining Cadet Corps. The Corps was entered at the age of no earlier than 12 years, primarily the children of mining officers and officials. The younger students were called cadets, and the older ones were called non-commissioned officers. Some students – boarders – were kept on state support, while others were supported privately or at their own expense. According to the Charter, there were 60 students in the Building, but by 1810 the number of students had grown to 218 people, and among them – 131 boarders, privately supported or at their own expense boarders [8, Op. 1. D. 2307. L. 24]. In the second half of the 1820s, the number of students in the Building reached over 500 people [2, p. 672]. At the same time, the annual number of graduates of the Building, which also provided general gymnasium education, did not exceed 20 people. According to the Charter of 1804, graduates of the Corps were sent "to the places appointed by the Authorities to the factories of the department of the Berg-Collegium and the Cabinet" with the rank of Interns [9]. For the entire period of the existence of the Mining Cadet Corps (1804-1833), 339 people received this title [2, p. 749-750]. Another 15 Trainees graduated in 1833, when for several months the educational institution was called the Mining Institute [2, p. 750].

On January 1, 1834, Emperor Nicholas I approved the "Regulations on the Corps of Mining Engineers" and from that time the title of Mining Engineer was established in Russia. According to the Charter of 1834 at the Institute of the Corps of Mining Engineers, the number of students (cadets, conductors and officers) was determined at 320 people, but in reality there were fewer of them. For example, in March 1849, 226 students were trained, including 129 people at the state expense, 65 boarders from various organizations and 32 self-employed boarders [8, Op. 1. D. 4878. L. 13]. According to the Charter of 1834, persons who graduated from the Institute of the Corps of Mining Engineers (1834-1866) were already graduated as Mining Engineers and, depending on their academic success, with the rank of Lieutenant and Second Lieutenant. Students who showed poor knowledge were entitled only to the civil rank of the XIII class. In 1848, a new Charter was adopted, according to which, those who completed a full course of sciences at the Institute of the Corps of Mining Engineers, according to the same criteria, were issued Engineer-Lieutenants, Sub-Lieutenants, Ensigns and, in the worst case, Provincial Secretaries or Collegiate Registrars. In just 33 years, 447 specialists have left the walls of the Institute of the Corps of Mining Engineers, the most of them in the officer rank, and only 14 in civilian rank.

In the Era of the Great Reforms of Alexander II (1855-1881), after the abolition of serfdom, a new stage has come in the history of the Mining Institute. According to the new Charter approved on June 15, 1866, the Mining Institute was transformed from a closed military to an open higher educational institution. From now on, access to higher mining and technical education has become free for everyone who had a gymnasium education. In 1866, the last graduation by military ranks took place, and a year before that, the students of the Mining Institute took off their military uniforms. Students were divided into state-funded (who studied and were supported entirely at the expense of state funds) or scholarship holders in the number of 30 people, self-supported and free listeners. A five-year course of study was introduced at the Mining Institute. In the first three years, all students studied general subjects. In the last two years, all special subjects were divided into two categories: mining and factory.

[1] Shichtmeister is a junior mining rank in the Russian Empire. According to mining Table of Ranks of 1722 the rank of junior shichtmeister (XIII class) corresponded to the rank of army second lieutenant or a provincial secretary in the civil service, senior shichtmeister (XIV class) corresponded to the rank of army ensign; berg-geschworen – chief officer rank of the XIth class.

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During the reorganization of the Mining Institute into an open educational institution, the number of students in it has significantly decreased. In October 1865, there were exactly 100 of them left [8, Op. 1. D. 5089. L. 48-50]. However, ten years later, there were almost four times more students – 390 people. In the 1880s, their number decreased again, because, firstly, due to the influx of a large number of students at the Institute, there was not enough classroom fund and, secondly, among the applicants there were many random people, who did not show up for classes and exams.

On April 29, 1896, by Order of Nicholas II, the Mining Institute was given the name of the Mining Institute of Empress Catherine II. According to the new rules, the division of items into categories was canceled, but two years later, the Institute's Board recognized this decision as erroneous and petitioned for their restoration. However, only in 1904, by decree of Nicholas II, the curriculum of the Mining Institute of Empress Catherine II underwent changes and Mining subjects were again divided into two categories: mining and factory.

The rapid economic recovery that took place in Russia in the 1880-1890 required a constant increase in the number of highly qualified specialists in the fuel and metallurgical industries. The profession of a mining engineer was becoming more and more prestigious. These factors determined the growth of the number of students at the turn of the century. If in 1892 there were 269 people studying at the Mining Institute, then 10 years later, in 1902 there were already 663, in 1905 – 704, in 1910 – 986, in 1914 – 944 [3, p. 38]. The increase in the number of students was associated, among other things, with the transition in 1905 to the so-called subject system of the course. The essence of this system was to abolish the division of students into courses, starting from the second and from the second year of the distribution of all subjects by semesters, establishing the sequence of study. At the same time, students were given the right to independently determine the time of exams and deadlines for the execution of works. This freedom of study was abolished in 1912, as it had an obvious disadvantage – many students studied for 8-10 years, interrupting their studies for a long time by working in mines, in geological expeditions.

From 1867 to the 1917/18 academic year, graduates of the Mining Institute were awarded diplomas for the title of Mining Engineer, depending on the points received at the final exams, in the first or second category. In total, during this half a century, 2,235 students graduated from the Mining Institute, 2,026 of them received diplomas of Mining engineers in the first category, 206 in the second, and three more students (two of them Bulgarian nationals) in 1909 did not have the right to receive a diploma of a Mining engineer.

Thus, based on the list of persons who graduated from Mining from 1773 to 1923, published in the anniversary edition of the "Mining Journal", it follows that since the foundation of the Mining School and up to 1918 inclusive, 3,152 of its students graduated from Mining [2, p. 748-763]. Unfortunately, this is not a complete list, since there is no information available for 1777-1786, 1788-1789, 1794 and 1796. Judging by statistics for other years, at this time, on average, there were no more than 10-12 people who graduated from the school annually. Thus, it can be assumed that the total number of Mining graduates in the pre-revolutionary period was about 3,300 people. This number is slightly different from the data provided by the authors of another anniversary edition of the Leningrad Order of Lenin Mining Institute for 30 years of Soviet Power. In their opinion, "for 144 years of its pre-revolutionary activity" the Mining Institute has trained 3,170 engineers [10, p. 12, 84].

Despite the severe upheavals experienced by the Mining Institute during the Great Russian Revolution of 1917-1922, academic life in it was not interrupted. In the 1916/17 academic year, the Institute graduated 73 mining engineers, in 1917/18 – 78. In April 1918, the Council of the Mining Institute decided to form three faculties: Geological Exploration, Mining-Factory, and Mining. In the autumn of 1919, the Mining and Mechanical Faculty was added to them. A five-year term of study was established with its division into 10 semesters. In the hard hungry and cold years of 1918/19 and 1919/20, 12 and 10 people were able to graduate from the Petrograd Mining Institute, respectively. Since 1920, the gradual recovery and revival of the educational life of the Mining Institute began. The issue of 1920/21 was already 27 people, the issue 1921/22 – 38, 1922/23 – 36 [2, p. 690, 691] (according to other data – 45), 1923/24 – 50 [3, p. 54]. There are serious discrepancies on the issue of 1924/25. Thus, according to information from the archive of the Mining University in 1925,

22 graduates received diplomas of mining engineers [11, 1944, 330, L. 1], however, in the "Jubilee Volume" of 1926 another number is indicated – 125 [3, p. 54].

Of course, after the Great Russian Revolution of 1917-1922, there were drastic changes in the social structure of the students. The Soviet state established the "class principle" of admission to universities, providing all kinds of benefits to students of working-peasant origin, and in every possible way limiting the opportunities for higher education for people from "socially alien" strata of the population, the so-called former – nobles, clergy, and bourgeoisie. This policy continued until the end of 1935. Therefore, if before the revolution, the vast majority of students were children of privileged and semi–privileged classes, and the children of the proletarians and peasants are only a small part, then in the 1921/22 academic year, out of 984 students, from the working class made up 11 % (108 people), from peasants – 34.45 % (339 people), Soviet employees – 25.4 % (250 people). By 1925, the share of workers increased to 27.30 %, employees to 36.11 %, and peasants decreased slightly to 30.67 % [3, p. 39]. Throughout the history of the USSR, information about the social structure of students was a mandatory item in the annual reports on the activities of universities in the country. Interestingly, among the students of LMI, the share of immigrants from peasants (in the documents – "collective farmers and their children") decreased every year. For example, in 1980 there were only 1 % of them, while the working class was represented by 52 %, and employees – 47 % of students [12, Op. 10. D. 750. L. 141].

In 1924 The Petrograd Mining Institute was renamed the Leningrad Mining Institute. During Stalin's forced industrialization (late 1920s –1930s), the country needed tens of thousands of engineers. The resolutions of the Plenums of the Central Committee of the CPSU(b), the CEC and the SNK of the USSR of the late 1920-1930s were aimed at a radical restructuring of higher education. Not all the reforms were successful. The Time of Troubles came for the Leningrad Mining Institute on May 31, 1930, when it was reorganized into the Leningrad Higher Geological Exploration School, which also included the Leningrad Geological Exploration College [13, p. 83]. At the beginning of August of the same year, the Higher Geological Exploration School was renamed the Leningrad Geological Exploration Institute, but less than three weeks later, it was divided into two educational institutions: The Leningrad Geological Exploration Training Combine and the Leningrad Mining Institute of Nonmetallic Minerals (from January 1, 1931, the Leningrad Mining and Nonmetallic Training Combine). The series of reorganizations ended on December 27, 1931, when both educational complexes were merged with the restoration of the former name – Leningrad Mining Institute (LMI).

During the years of the first five-year plans, the number of students at the Leningrad Mining Institute has grown rapidly. If on January 1, 1925, there were 897 students in LMI [12, Op. 2. D. 34. L. 2], then in 1939 there were 1,880 students studying at three faculties (Geological Exploration, Mining and Mining and Metallurgical), who trained engineers in 10 specialties [12, Op. 2. D. 375. L. 10]. However, the reorganization of the LMI in 1930-1931, as well as the transition first to 4-year, then 3-year and, finally, the return to 5-year education could not but affect the quality of education and the number of graduates (Table 1).

Table 1

The number of graduates of LMI in the period of industrialization*

Year	Number of graduates	Year	Number of graduates	Year	Number of graduates
1926	54	1931	196	1936	651
1927	82	1932	92	1937	406
1928	103	1933	61	1938	122
1929	121	1934	239	1939	134
1930	535	1935	711	1940	310

* The table is based on the materials: [11, 1944. D. 330. L. 1-69].

Regarding 1933, in another document of the archive of the Mining University – "Protocols for the distribution of young specialists in 1933" – there are 354 surnames [11, 1933. D. 75. L. 1-9]. There are different data in the literature regarding the number of qualified specialists trained by the

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Mining Institute during the first two decades of Soviet power – miners, geologists, metallurgists, mechanics, surveyors: 3702 engineers during the first five-year plans; 4,200 – for the period from 1918 to 1941 [10, p. 84]. According to our information given above, in 1918-1940 diplomas of the Mining Institute were received from 4,090 to 4,317 of its students.

In 1941, just before the Great Patriotic War and in its beginning, LMI graduated 197 engineers [11, 1944, D.330. L. 70-73] (according to other sources – 210 [10, p. 84]). The training of specialists did not stop during the war years. During the hard times of war, in the conditions of the blockade, and then in the evacuation to the city of Cheremkhovo (Irkutsk region) 150 people graduated from the Mining Institute: in 1942 – 1, in 1943 – 31, in 1944 – 60, in 1945 – 58 [10, p. 124].

After the war, the main task of the Institute was to increase the output of personnel necessary for the national economy and improve their training. The pre-war number of students was quickly recovered – on January 1, 1947, there were 1,846 people; 1948 – 2,201; 1949 – 2,560 [12, Op. 2. D. 895. L. 1-2]. Only for the first post-war five-year plan, LMI produced 1,261 engineers: in 1946 – 103, in 1947 – 200, in 1948 – 259, in 1949– 355, in 1950 – 344 [13, p. 92].

In the 1960s, two factors influenced the growth in the number of engineers trained within the walls of LMI. Firstly, new faculties were opened at the Mining Institute, which trained mine constructors, oil engineers (1948-1957), economists for the mining industry, specialists in the field of radio electronics (1962-1971). Secondly, starting in 1958, taking into account the increasing need for engineers in the main mining and metallurgical regions of the USSR, the Leningrad Mining Institute began training specialists in extramural and evening forms of education, which led to a sharp increase in the number of students. So, if in the 1956/57 academic year there were 4,145 people, then 10 years later, in the 1966/67 academic year, there were more than twice as many – 9,630 [13, p. 95].

Branches of the Institute with evening and correspondence courses forms of education designed to provide on-the-job training existed in Slantsy (Leningrad Region), Vorkuta (Komi ASSR, now the Komi Republic), Kirovsk and Monchegorsk (Murmansk Region). In Inta, there was a Training and Consulting Center (TCC), transformed in 1987 into the General Technical Faculty (GTF) (Table 2).

Table 2

The number of students enrolled in full-time departments, evening and correspondence courses departments (faculties)

Academic year	Full-time	Evening	Correspondence	Total
1962/63	2618	1722	2904	7244
1964/65	2743	2261	3580	8584
1976/77	4285	1887	1598	7770
1980/81	4371	1973	1967	8311
1987/88	3381	522	2471	6374
1989/90	3851	1734	2250	7835

Note. The table is based on the materials: [14, Op. 9. D. 127. L. 42; D. 141. L. 55, 12, Op. 10. D. 750. L. 144; Op. 12-2. D. 429. L. 6, 13, 20].

During this period, the number of young specialists – engineers with diplomas of the Leningrad Mining Institute grew every year. For example, in 1963 there were 532 of them; in 1965 – 698; in 1968 – already 1,097; in 1970 – 1,068; in 1972 – 1,137 [14, Op. 9. D. 127. L. 38; D. 148. L. 62; D. 206. L. 18, 12, Op. 10. D. 933. L. 4].

The first graduation of evening faculty students took place in 1960 – 7 people, the correspondence faculty in 1964 – 34 people. However, at the end of the 1980s, the low efficiency of evening and correspondence learning became increasingly obvious to the management of the Institute. A big problem was the skipping of classes and the high dropout rate of evening and correspondence students during the study period. The last graduation of students who studied in the evening form took place in 2015 – 302 people, in correspondence form in 2018 – 21 people.[2]

[2] Saint Petersburg Mining University. Statistical report in the form of VPO-1.

A few words about foreign students. The first foreign students appeared at the Leningrad Mining Institute in 1946 [12, Op. 7. D. 315. L. 6], in the 1951/52 academic year, there were 110 of them. Almost all of them (except one Greek) represented the countries of the socialist camp or, according to the official terminology of that time, "the countries of people's democracy". Most of all were Poles (24), Romanians and Bulgarians (21 each), Chinese (16) [12, Op. 7. D. 28. L. 1-2]. In the 1955/56 academic year, 273 foreign students studied at the Institute, of which 49 people graduated from the institute in June 1956, including 23 Chinese, 10 Romanians, 6 Hungarians, 3 Bulgarians, 3 Koreans, 2 Poles and 2 Czechs. In 1956/57, 246 students studied at the Institute, 110 of them were from China, 50 from Bulgaria [12, Op. 9. D. 89. L. 143, 144]. In the future, the contingent of students is gradually changing – more and more students from the countries of the so-called third world (Africa and Asia) come to the Mining Institute. Thus, in 1963, 119 foreigners (94 students and 25 postgraduates) were studying at the Institute, representing 22 countries, of which 8 were socialist and 14 were "capitalist, economically underdeveloped" [12, Op. 9. D. 554. L. 230]. In 1974, 205 students, 22 postgraduates, 8 interns and 10 correspondence courses postgraduates represented 37 countries [14, Op. 9. D. 220. L. 8]. In 1978, there were already 360 students, interns and postgraduates from 52 countries. Most of them studied at the geological exploration, geophysical, metallurgical and surveying faculties [14, Op. 9. D. 284. L. 103]. In March 1988, 376 foreign students, 43 postgraduates and 15 interns from 56 countries studied at LMI. Of these, about 40 % were representatives of "developing countries" [12, Op. 12-1. D. 345. L. 92]. In 1992, 238 students, 38 postgraduates, 26 interns from foreign countries were trained at the Mining Institute [12, Op. 12. D. 652. L. 107]. The geography of these countries was quite extensive: Germany, Bulgaria, Czechoslovakia, Israel, but most of the students came from developing countries – Algeria, Angola, India, Cameroon, Cuba, Lebanon, Ethiopia, etc.

According to the authors of the collective monograph dedicated to the 200th anniversary of the LMI, for 1945-1972, Institute has trained about 20 thousand specialists for the national economy [13, p. 101] (Table 3).

Table 3

Number of graduates from 1973 to 2023

Years	Number of graduates	Years	Number of graduates
1973-1979	7,771	2000-2009	12,006
1980-1989	10,993	2010-2019	23,941
1990-1999	9,166	2020-2023	6,877

Note. The table is based on the materials: [11, 1973, 1974, 1975, 1980, 1988-1994, 12, Op. 10. D. 750. L. 143]. Data for 1981-1987, 1995-2023 are taken from the source: Saint Petersburg Mining University. Statistical data report in the form of VPO-1.

In the mid-1990s, the number of graduates decreased: in 1994, there were 878, in 1995 – 717, in 1996 – 663, in 1997 – 656. The reasons for this were the crisis processes and phenomena caused by the collapse of the USSR: the growth of the economic crisis, the collapse of the former socio-political system, the loss of value orientations. During the period of radical market reforms in the first half of the 1990s, the government of President Boris Yeltsin sharply reduced funding for higher education. The professions of lawyer, manager, economist, and public relations specialist were popular among young people. The prestige of the engineering profession has fallen. Many technical universities of the country were going through hard times. Discussing at the Academic Council in October 1993 the low competition for admission of applicants, the rector of the Institute N.M.Proskuryakov stated: "The problem is this: will the institute exist or not. <...> In these conditions, the existence of the University is directly dependent on the competition and the contingent of students" [12, Op. 12-2. D. 714. L. 12].

Since the mid-1990s, despite the difficult economic conditions, the management of the Mining Institute, headed by the Rector, Professor V.S.Litvinenko, managed to change the situation radically for the better: the material and technical, educational and laboratory facilities were modernized, relations with

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Russian and foreign companies were significantly expanded, the Oil and Gas Faculty was established (2009), a number of new departments, new courses have been introduced into the curricula, reflecting current trends in mining. New promising areas were opened: "Architecture", "Construction", "Construction of unique buildings and structures", "Standardization and Metrology", "System analysis and Management", "Management in technical systems", "Instrumentation", "Electronics and Nanoelectronics", "Technology of transport processes" and others. A number of new areas of training appeared in 2012, in connection with the accession to the Mining University of the North-Western Correspondence Technical University (SZTU). Taking into account the modern realities of the global world, the Mining University was one of the first among Russian universities to teach students in the following programs "Engineering Ecology", "Ecology and environment Management" [15], "Computer Science and Computer Engineering", "Information Systems and Technologies" [16-18].

If in the 1973 anniversary year the staff of the Mining Institute taught students 18 specialties and 28 specializations, today the bachelors, masters, and specialists are trained at 9 faculties and 47 departments in 60 areas and specialties in the field of geology, mining, metallurgy, mining industrial and civil engineering, mining electrical engineering, oil and gas business, industrial safety, industrial economy and geoecology for enterprises of the mineral resource complex. Only in the last five years alone (2019-2023), the Mining University has trained 8,482 highly qualified specialists. In 2023, a record number of graduates in its entire history came out of the university – 1,867.

According to our calculations, over the previous half century (1973-2023), 70,754 graduates of the Mining University received diplomas of mining engineers-geologists, surveyors, metallurgists, ore enrichment specialists, geophysicists, geodesists, hydrogeologists, engineer-constructors, electricians, electrical engineering, economists, ecologists, automation engineers, etc. Taking into account some variation in statistics, the presence of certain gaps in documents and allowing for a certain error, it is safe to say that during this period the Mining University has trained about 71 thousand specialists of the mineral resource complex. This is almost three times more than in the entire previous period of its history, since the foundation of the Mining School.

In total, over its 250-year history, the Saint Petersburg Mining University has trained 98,731 or about 99 thousand highly qualified graduates.

Scientific and educational staff. Scientists and teachers. The main merit in the training of qualified mining specialists, mining engineers, in the formation and development of Saint Petersburg Mining University since its foundation belongs to unique teaching staff.

On June 28, 1774, the director of the Mining School M.F.Soymonov appointed the first five teachers: A.Martov was to teach students arithmetic and geometry, I.M.Renovants – surveying art and mineralogy, A.M.Karamyshev – chemistry, H.I.Lishenkol – mining mechanics, and I.Bogdanov – drawing. On September 12, they were joined by I.I.Chemnitzer, a teacher of French and German languages [19, p. 68]. After 30 years, according to the report of the inspector of the Mining School P.F.Ilman dated May 3, 1803, 18 teachers taught students and cadets at the educational institution [8, Op. 1. D. 447. L. 2, 3, 9 ob.]. In 1849, among 55 teachers there were 25 civil and 18 military ranks, 10 people who did not have a rank, as well as two clergymen [8, Op. 1. D. 4878. L. 13, 115, 117-123].

Its graduates, who became teachers, occupy a special place in the history of the Mining University. The first graduate of the Mining School to take a place at the department was Petr Fedorovich Ilman (1755-1818). A graduate of 1776, in 1781-1804 he gave students the knowledge in chemistry, mining, surveying and assay arts, as well as metallurgy, and in addition, he served as an inspector of the Mining School, and in the last years of his life was the commander of the Mining Cadet Corps (1813-1818). During the entire imperial period of the history of the Mining Institute, out of 119 professors and teachers of department subjects, 66 were its graduates. So, in 1865, during the radical reorganization of the Institute into an open civil educational institution, there were 21 teachers on its staff, and nine of its students taught classes in almost all special subjects [8, Op. 1. D. 5089. L. 46, 47].

In 1866, in accordance with the new Charter, the Mining Institute underwent major changes in the structure of the teaching staff. 17 departments were established at the Institute, where professors and adjuncts were to teach science. Other subjects were assigned to teachers. Persons who had completed

"with complete success a course at a Mining Institute or other higher educational institutions" could occupy the positions of professors and adjuncts. To do this, they were obliged to publicly defend their dissertations if they did not have a master's degree and, in addition, "read publicly, in the presence of the Council, two trial lectures: one on a topic by their own election, and the other by appointment of the Council." The Council of the Institute elected professors and adjuncts, after which the Minister of Finance approved them in these ranks [20, p. 691].

According to the staff of the Mining Institute in 1866, 9 positions of professors and 7 adjuncts were established. In addition to N.A.Jurgens, who was elected at the Department of Mining and Surveying, all other professors graduated from the Institute of the Corps of Mining Engineers at different times: P.A.Olyshev (graduate of 1837) was elected at the Department of Applied and Mining Mechanics, N.A.Ivanov (1837) – inorganic and Analytical Chemistry, V.G.Yerofeyev (1842) – paleontology, V.V.Bek (1846) – inorganic chemistry, N.A.Kulibin (1851) – metallurgy and assay art, P.V.Eremeev (1851) – crystallography and mineralogy, N.P.Barbot de Marny (1852) – geology, geognosy and ore deposits, G.A.Time (1853) – higher mathematics. Of the seven adjuncts, 5 are students of the Institute: K.I.Lisenko (1856) – at the Department of Chemistry, V.I.Meller (1860) – paleontology, K.D.Sushin (1865) – inorganic chemistry, N.A.Iossa (1865) – metallurgy, galurgy and assay art and A.P.Karpinsky (1866), elected by the Department of Geology and Geognosy.

The first person who defended his thesis at the Mining Institute to obtain the title of adjuncts (i.e. assistant professor) was Valerian Ivanovich Meller. It happened on March 19, 1867. He defended his dissertation at the Department of Paleontology: "About trilobites of the coal formation of the Urals". On November 17, 1868, in order to obtain the title of professor, Yuli Ivanovich Eichwald was the first to defend his dissertation. The topic of his research: "On the development of gold-bearing placers, especially in the Nerchinsk Mining District". He was recognized as deserving the title of professor at the Department of Mining and Surveying Arts [2, p. 741]. In total, 56 dissertations were defended in 51 years (1867-1918), 12 of them are for the title of professor [2, p. 741-745].

On the eve of the revolutionary upheavals, in the 1915/16 academic year, the teaching staff of the Mining Institute of Catherine II consisted of 78 people: 20 professors, 20 teachers (12 of them full-time) and 38 assistants (24 full-time). After the revolution, the staff of teachers increased. Therefore, in the 1924/25 academic year, 108 people – 37 professors, 41 teachers and 30 assistants, taught students of the Leningrad Mining Institute various sciences [3, p. 56].

In total, according to the anniversary edition dedicated to the 150th anniversary of the Institute, since the foundation of the Mining School and until the beginning of the 1925/26 academic year, 163 professors taught department subjects; during the same period, the total number of teachers of non-departmental subjects, minus assistants, amounted to 144 people [3, p. 55].

In March 1932, after a series of reorganizations of the University in 1930-1931, 460 people taught classes at 52 departments. However, such a large number of teaching staff per the number of students (2552 people) has its own explanation – many teachers at LMI were part-timers. According to the report on the state of affairs at LMI, "a very large number of teachers, mainly in special disciplines, were the main employees not at the Institute, but at work – in TsNIGRI, in GIPROSCHAKHT, GIPRORUDA, GIPRONEM, MECHANOBR and other institutions". The problem was that, due to the business trips of these specialists to different cities, "very often" there were "disruptions of classes" at the Institute. Therefore, an important task facing the leadership of the LMI was "securing a sufficient cadre of teachers for the institute" [11, 1932, D. 61. L. 7] (Table 4).

Unfortunately, Stalin's repressions did not bypass the LMI either. So, in 1937-1938, the victims of the "great terror" were the famous scientists D.I.Mushketov, A.K.Boldyrev, Professor N.V.Bobkov, associate professors V.Y.Cherkesov, V.V.Chernykh and a number of geologists of the Research Institute who collaborated with LMI [21].

It is easy to see that the proportion of full-time teachers with academic degrees has been constantly increasing. Today, more than 93.5 % of teachers have academic degrees and titles. In the 2022/23 academic year, 650 teachers worked at 9 faculties and 47 departments of the Empress Catherine II Saint Petersburg Mining University, 94 of them were doctors of sciences, 508 candidates of sciences. Their average age is 45 years.

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Table 4

Teaching staff of Leningrad Mining Institute – Saint Petersburg Mining University

Academic year	Doctors of Sciences	Candidates of Sciences	Without degree	Total	Total with degrees, %
1938/39	22	74	162	258	37.2
1963/64	42	178	210	430	51.2
1968/69	46	236	266	548	51.5
1975/76	72	290	231	593	61
1978/79	75	304	205	584	64.9
1980/81	74	342	209	625	66.5
1989/90	63	347	167	577	71
1992/93	97	346	170	613	73.4
2010/11	124	352	64	540	88.2
2022/23	94	508	48	650	93.5

Note. The table is based on the materials: [12, Op. 2. D. 375. L. 13, 180 ob.; Op. 10. D. 658. L. 9; D. 293. L. 136; D. 933. L. 18; Op. 12-2. D. 429. L. 6 ob.; Op. 12. D. 652. L. 101, 14, Op.9. D. 134. L. 96; D. 284. L. 206, 15].

Since its birth, the Mining University has been known for its famous teachers – academicians. In 1779, corresponding members of the Imperial Academy of Sciences and Arts in Saint Petersburg were elected the first chemistry teacher at the Mining School A.M.Karamyshev and a teacher of physics, mineralogy, surveying art, initiator of the construction of an educational "exemplary mine" at the school Ivan Mikhailovich (Johann Michael) Renovants. After the death of I.M.Renovants, for four years (1798-1802), academician L.Yu.Kraft taught physics at the Mining College (1771).

From the first years of the existence of the Mining University, much attention was paid to the teaching of chemistry. In 1791-1804, chemistry, metallurgy and assay art were taught by V.M.Severgin, academician of the Imperial Academy of Sciences (1793) and a member of 18 scientific Russian and foreign societies [21]. He was also the author of the first textbook on assay art in Russian. In 1808, Academician of the Imperial Academy of Sciences (1815) A.I.Scherer was invited to teach chemistry in the Mining Cadet Corps. He divided the teaching of chemistry and metallurgy, published the first textbook on chemistry "A Guide to teaching Chemistry" in Russian. In 1835, academician (1830) G.I.Hess, the author of the textbook "Foundations of Pure Chemistry", was approved as a professor of chemistry at the Institute of the Corps of Mining Engineers. From 1826 until his death (1841), a corresponding member of the Academy of Sciences (1830) P.G.Sobolevskyi headed the chemical laboratory. Research work in the laboratory was carried out by orders of the Department of Mining and Salt Affairs. For more than 15 years (1839-1855) lectures on paleontology were given by a graduate of the University of Berlin, professor, corresponding member of the Imperial Academy of Sciences (1826) E.I.Eichwald.

Other scientists have earned the title of academician after completing their careers at the Mining Institute. Thus, I.S.Rizhskyi, the first teacher of oratory (1786-1796) and author of works on oratory, literature, logic and philosophy, in 1902 was elected a member of the Russian Academy, which was engaged in the study of the Russian language and literature [23]. In 1815-1826, the course of general and physical chemistry was taught by M.F.Solovyov, a professor at Saint Petersburg University, known for the development of Russian chemical nomenclature, who became a corresponding member of the Imperial Academy of Sciences in 1826, and then its honorary member (1841).

A special place among the academicians who have ever worked in Mining, deserve its graduates. There are a whole cast of them – mining scientists, world-famous specialists. Therefore, 47 years after graduating from the Mining Cadet Corps in 1805, D.I.Sokolov (1788-1852) worked there, teaching future interns, and then mining engineers the wisdom of geology, geognosy, mineralogy, mining and assay arts. The author of Russian first textbook on geology, he was one of the founders of the Mineralogical Society (1817), editor-in-chief of the "Mining Journal" (1825-1840), and in 1841 was elected an honorary member of the Department of Russian Language and Literature of the Imperial Saint Petersburg Academy of Sciences.

In addition to D.I.Sokolov, before the revolution of 1917, 6 more scientists-teachers of the Mining Institute were elected academicians of the Imperial Saint Petersburg Academy of Sciences: G.P.Helmersen (1850), N.I.Koksharov (1866), P.V.Eremeev (1894), A.P.Karpinskyi (1896), F.N.Chernyshev (1899) and N.S.Kurnakov (1913). After the revolution, 26 scientists became academicians of the Russian Academy of Sciences, and since 1925 of the USSR Academy of Sciences, for whom the Mining Institute was the alma mater: E.S.Fedorov (1919), D.P.Konovalov (1923), A.A.Borisyak (1929), I.M.Gubkin (1929), N.M.Krylov (1929), V.A.Obruchev (1929), M.A.Pavlov (1932), A.A.Skochinskyi (1935), A.M.Terpigorev (1935), A.P.German (1939), A.N.Zavaritskyi (1939), P.I.Stepanov (1939), S.S.Smirnov (1943), I.F.Grigoriev (1946), S.I.Mironov (1946), D.V.Nalivkin (1946), A.G.Betekhtin (1953), D.S.Korzhinskyi (1953), V.S.Sobolev (1958), A.P.Krylov (1968), N.A.Shilo (1970), P.I.Melnikov (1981), N.N.Puzyrev (1984), I.S.Gramberg (1987), N.L.Dobretsov (1987), D.V.Rundqvist (1990). In addition, during the Soviet period, 17 more graduates of LMI became academicians of eight republican Academy of Sciences. Of these, 5 are Academy of Sciences of the Ukrainian SSR, 4 are Academy of Sciences of the Kazakh SSR, 2 each are Academy of Sciences of the Armenian SSR and Tajik SSR, as well as Academy of Sciences of the Azerbaijani SSR, Belarusian SSR, Kyrgyz SSR, Turkmen SSR.

In the post-Soviet period, four scientists who graduated from the Leningrad Mining Institute were awarded the high title of Academician of the Russian Academy of Sciences: N.L.Dobretsov (1991), D.V.Rundqvist (1991), A.D.Shcheglov (1992), and S.V.Goldin (1997).

In 1883, Professor V.I.Meller, a graduate of the Institute of the Corps of Mining Engineers (1860), who taught paleontology at the Mining Institute in 1867-1885, was elected a corresponding member of the Imperial Saint Petersburg Academy of Sciences. In 1893-1900, he was the director of the Mining Institute. In the Soviet period, the first corresponding member of the Russian Academy of Sciences was a graduate of the Mining Institute in 1893, head of the Department of Paleontology N.N.Yakovlev (1921). After him, 32 graduates of the Leningrad Mining Institute were elected corresponding members of the USSR Academy of Sciences: V.E.Grum-Grzhimailo (1927), V.N.Lipin (1928), N.I.Stepanov (1929), N.N.Kachalov (1933), I.M.Bakhurin (1939), A.G.Volgdin (1939), I.I.Gorskyi (1943), Yu.A.Bilibin (1946), Yu.A.Zhemchuzhnikov (1946), N.G.Kell (1946), V.A.Nikolaev (1946), V.P.Rengarten (1946), N.N.Slavyanov (1946), O.D.Levitsky (1953), P.M.Tatarinov (1953), G.B.Bokiy (1958), B.I.Piip (1958), V.N.Saks (1958), G.I.Mankovsky (1960), I.S.Rozhkov (1960), V.D.Nalivkin (1968), N.B.Wassoevich (1970), L.I.Krasnyi (1970), I.E.Gubin (1976), K.F.Sergeev (1979), A.D.Shcheglov (1979), K.V.Bogolepov (1981), A.I.Zhamoyda (1987), S.V.Krylov (1987), N.M.Proskuryakov (1988), V.A.Mironenko (1990), S.V.Goldin (1991). Besides them, 5 graduates of LMI became corresponding members of the Academy of Sciences of the Kazakh SSR and one of the Academy of Sciences of the Ukrainian SSR. For 32 years of the modern history of Russia, 8 more names of scientists, graduates of the Mining University, elected corresponding members of the Russian Academy of Sciences, have been added to this honorary list. These are V.A.Glebovitskyi (1991), Yu.E.Pogrebitskyi (1991), G.P.Luzin (1997), D.A.Dodin (2000), M.D.Belonin (2003), V.G.Rumynin (2003), Yu.B.Marin (2008), T.N.Alexandrova (2022).

Thus, for the 250-year history of Saint Petersburg Mining University, 98 of its students were elected to the Academy of Sciences. Of these, 52 were academicians and 48 were corresponding members (four – N.L.Dobretsov, D.V.Rundqvist, A.D.Shcheglov and S.V.Goldin – were elected to both the USSR Academy of Sciences and the RAS). This remarkable list includes 22 academicians and 23 corresponding members who have taught and continue to teach at the Mining University in different eras.

Let us note those graduates of the Mining Institute who have devoted more than a dozen years of their lives to teaching and organizing science within the walls of the Institute, giving all their strength to the training of mining specialists and the development of science. During the imperial period of Russia's history, Georgyi Augustovich Time (1831-1910) served the Mining Institute for a record number of years. One of the founders of surveying science in Russia, an honored professor of the Mining Institute, he taught higher mathematics, mining and surveying art there for 55 years. His younger brother Ivan Augustovich Time (1838-1920), after ten years of work at the factories of the Urals and Donbass, taught mining and applied mechanics, hydraulics and other disciplines at the Mining Institute for about 45 years (1870-1915).

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For more than 40 years, academicians Nikolai Ivanovich Koksharov (1818-1892) and Pavel Vladimirovich Yeremeyev (1830-1899) worked at the Mining Institute. N.I.Koksharov, an outstanding mineralogist, author of the fundamental essay "Materials for Mineralogy of Russia", was director of the institute from 1872 to 1881. P.V.Eremeev (1830-1899) began his career at the Mining Institute as an assistant to the museum curator, from 1857 to 1895 he was a professor of mineralogy and crystallography, at the same time for 30 years he carried out tremendous work in the Mineralogical Society, being the keeper of its traditions.

Academician Grigorii Petrovich Helmersen (1803-1885) – founder of the Russian school of geological cartography, director of the Mining Institute (1865-1872) and the first director of the Geological Committee (1882), immediately after graduating from the Institute of the Corps of Mining Engineers (1838), taught geology and geognosy there for 25 years. For 60 years of his active work in Russia, there was not a single important issue of practical geology and mining that would have taken place without his participation.

For more than three decades, representatives of the mining dynasty of German origin Iossa worked at the Mining Institute. Professor Grigorii Andreevich Iossa (1804-1874) in 1823 was the first of the graduates of the Mining Cadet Corps, as it was named at that time, to be listed on the marble plaque of the conference hall as the owner of a large gold medal. For more than 30 years (1832-1868), he taught metallurgy, gallurgy, mining and assay art. The same sciences were taught in 1871-1898 by Professor Nikolai Alexandrovich Iossa (1845-1916), who for a short time (1900-1901) was the director of the Mining Institute.

36 years of the life of Professor Joseph Ivanovich Laguzen (1846-1911) are associated with the Mining Institute. For many years, scientist taught paleontology, wrote the first textbook in Russian on paleontology, which became a reference book for many generations of Russian geologists. In 1901-1903, he was the director of the Mining Institute. For thirty years (1839-1870), Petr Alekseevich Olyshev (1817-1896) taught surveying, higher mathematics, mining, and applied mechanics. Konon Ivanovich Lisenko (1836-1903) taught organic, inorganic and analytical chemistry for almost 30 years. He wrote the first manual on oil technology in Russian[3].

In 1868, two years after graduating from the Mining Institute, Alexander Petrovich Karpinskyi (1847-1936), the first elected president of the Russian Academy of Sciences and president of the USSR Academy of Sciences (1917-1936), began teaching at the Department of Geology and Geognosy for 27 years lectured on geognosy, petrography, ore deposits. Since 1866, his activity began as part of the Academy of Sciences, which lasted for 50 years.

For a quarter of a century (1877-1902), Professor Ivan Vasilyevich Mushketov (1850-1902), the largest researcher of the geology of Central Asia, who created a school of Russian geologists – mining engineers at the Mining Institute, lectured on geology and physical (dynamic) geology. For more than two decades, an outstanding chemist, the founder of the school of physical and chemical analysis, academician Nikolai Semenovich Kurnakov (1860-1941) taught chemistry at the Mining Institute [24]. For the same number of years, the first elected director of the Mining Institute (1905-1910), an outstanding crystallographer, academician of the Academy of Sciences of Russia Yevgraf Stepanovich Fedorov (1853-1919) lectured at his alma mater, on whose initiative the "Journal of Mining Institute" began to be published.

During the difficult period of the history of Russia at the turn of the century, the period of wars, revolutions, the collapse of the Russian Empire and the formation o,f a new state of the USSR, many outstanding scientists, representatives of the pre-revolutionary school of miners continued to work in the field of education and mining science: A.A.Borisyak (1872-1944), academician of the USSR Academy of Sciences, one of the founders of the national paleontological and stratigraphic school, head of the Department historical Geology (1911-1930); I.M.Bakhurin (1880-1940), corresponding member of the USSR Academy of Sciences, Head of the Department of Surveying Art (since 1923) [25]; V.N.Lipin

[3] Lisenko K.I. Oil production, compiled according to the latest data, by K. Lisenko, Professor of the Mining Institute and Chairman of the 1st Department of the Imperial Russian Technical Society. St. Petersburg: Printing House of the Panteleev Brothers, 1878, p. 282.

(1858-1930), Corresponding Member of the USSR Academy of Sciences, Head of the Department of Metallurgy, Rector of LMI (1927-1929); N.N.Yakovlev (1870-1966), Corresponding Member of the Russian Academy of Sciences, who headed the Department of Paleontology until 1929; V.I.Bauman (1867-1923), Professor, Head of the Department of Surveying and Geodesy (since 1899 G.); B.I.Bokiy (1873-1927), Professor, Head of the Department of Mining Art (since 1914); D.I.Mushketov (1882-1938), professor, world-famous scientist, expert in the geology of Central Asia, Head of the Department of General Geology and Director of the Mining Institute (1918-1926); A.N.Kuznetsov (1877-1946), professor, one of the organizers of the aluminum industry in the USSR, inventor of a new explosive SINAL-AK (1938-1941), the production of which in besieged Leningrad played a significant role in the defense of the city [26].

However, Nikolai Pudovich Aseev (1871-1952) and Alexander Petrovich German (1874-1953) worked the longest among the pleiad of scientists-miners with pre-revolutionary experience at the Leningrad Mining Institute. An outstanding scientist in the field of non-ferrous metallurgy, Professor N.P.Aseev began his educational and scientific activity at the Saint Petersburg Mining Institute of Catherine II in 1898 and continued it for 54 years. Head of the Department of Metallurgy of Non-ferrous and Precious Metals (since 1912) and Non-ferrous Metallurgy (since 1939), he is rightly considered the father of non-ferrous metallurgy in Russia [27]. Academician of the USSR Academy of Sciences, founder of the national school of mining mechanics A.P.German gave 46 years to the Mining Institute. He began teaching in 1907, from 1915 until the end of his life, he headed the Department of Mining Mechanics and, in addition, for many years he was assistant director of the Institute for academic affairs and vice-rector for scientific work. In the difficult 1930s, when the directors of LMI did not stay in their chair for a long time, in their absence it was A.P.German who acted as the head of the university.

Listing the names of all teachers, creators and inventors of the Soviet era and modern times, who taught students of the Mining Institute the intricacies of mining sciences, will take up a lot of time, but four scientists and teachers should be mentioned in particular. Dmitry Pavlovich Grigoriev (1909-2003) graduated from LMI in 1934 and gave almost 70 years to the Institute and the Department of Mineralogy, having worked his way up from assistant to professor and head of the department (1946-1985). Graduate of 1915 Dmitryi Vasilyevich Nalivkin (1889-1982), an outstanding geologist and paleontologist, academician of the USSR Academy of Sciences, creator of the paleontological and stratigraphic scientific school, worked in the field of education and science for more than 60 years, of which 50 – headed the Department of Historical Geology of the LMI [28]. Alexey Alekseevich Borisov (1911-2003) taught at the Institute for about 60 years. The beginning of his educational activity occurred during the war years, when he was appointed head of the workshop of special production, located on the territory of the Mining Institute, which manufactured hand grenades for the front. After the war, he, a professor, headed the department of formation deposits development for many years. On his initiative, a new academic specialty "Physical processes of mining production" was opened at the Institute [29]. For half a century, Pavel Mikhailovich Tatarinov (1895-1976), a corresponding member of the USSR Academy of Sciences, a major scientist, the creator of an independent branch of the doctrine of minerals, a long-term head of the Department of Geology of mineral deposits, an excellent organizer and a brilliant lecturer, has been associated with the Mining Institute. Let us allow ourselves to break the official narrative with a small illustration to the portrait of this remarkable scientist and teacher. According to the memoirs of a graduate of LMI, Professor P.A.Stron, exams at P.M.Tatarinov have always been a difficult test for students, "for many accompanied by troubles". Once the students who had already passed the exam saw the next stream "steaming" in the corridor of their "department on the second floor of the large educational building. A disheveled and joyful girl flies out of the office door." "Well, what?" – Students ask her. And "in response, with delight in her voice, she replies: "Two! But how does he ask!!!" [12, Op. 10. D. 384. L. 136].

The list of scientists and teachers who have given a lot of effort and energy to mining science and the Mining Institute, who have brought up more than one generation of mining engineers in it, will not be complete if we do not name those who, having crossed the half-century mark of work at the Mining University, becoming part of its glorious history, continue to work in its classrooms and laboratories, transmitting their knowledge and experience to the younger generation of miners. These are corresponding

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member of the Russian Academy of Sciences Yu.B.Marin, Doctors of Sciences, Professors V.V.Gabov, S.G.Gendler, V.V.Glazunov, R.E.Dashko, O.A.Dubovikov, E.A.Zagrivny, V.P.Zubov, M.A.Ivanov, A.V.Kozlov, A.K.Nikolaev, N.V.Pashkevich, A.G.Protosenya, V.M.Sizyakov, V.L.Trushko.

It should also be noted that 62 mineral species have been named in honor of 57 geologists and mineralogists – graduates and employees of the Mining Institute. Among these 57 people, 51 are graduates of the Institute, while 33 of them became its teachers or researchers [30, p. 128].

Scientific achievements. In order to evaluate with the help of numbers the contribution of scientists, graduates of the Mining University to the development of mining production, the entire mineral resource complex of Russia, probably, the efforts of the Institute of Statistics will be needed. But it is practically impossible to do this. Throughout the history of the Mining University, thousands of its graduates, scientists, inventors have created and strengthened the economic, scientific and technical foundation of the Russian statehood. Let us focus on the most significant events.

On January 7 (19), 1817, the Mineralogical Society was established in the Mikhailovsky Castle of Saint Petersburg. Among its 33 founders, four were prominent figures of the Mining Institute – E.I.Mechnikov (a graduate of the Mining College in 1791, director of the Mining Cadet Corps in 1817-1824), paleontology teacher Ya.G.Zembnitsky and future academicians V.M.Severgin and D.I.Sokolov. In the summer of 1869, on the initiative of the president of the Society, Academician N.I.Koksharov, the Mineralogical Society moved to the premises of the building of the Mining Institute. Since then, all meetings, assemblies and congresses have always been held at the Mining University. The Presidium and the library are also located here. In 1842, the publication of the journal "Notes of the Mineralogical Society" began. Since the first decade of the Society's existence, the post of President (Director) were held (after 1917 they were elected) by major graduate scientists and professors of the Mining Institute. Currently, the Mineralogical Society is headed by Corresponding Member of the Academy of Sciences of the Russian Academy of Sciences, Professor of the Mining University Yurii Borisovich Marin (2015-2021, since 2022 – Honorary President). It would not be an overstatement to say that "in the national history of Earth sciences, the relationship between scientists of the Mineralogical Society and the Mining Institute looks inseparable and highly productive" [31, p. 4].

On March 15 (27), 1882, the first meeting of the Scientific Council of the Geological Committee was held at the apartment of Professor V.I.Meller of the Mining Institute, at which Academician G.P.Helmersen, the former director of the Mining Institute, was elected its director. The remaining 7 elected members of the Geological Committee were also employees of the Institute. Thus, with the active participation of scientists of the Mining Institute in Russia, the first institution of the state Geological Service was created – the Geological Committee (1882-1930). It was created for the systematic and comprehensive study of the subsurface of the Russian Empire and the compilation of geological maps. Under the leadership of the director of the Geological Committee A.P.Karpinsky (1885-1903), the first geological maps of European Russia were compiled. The work of geological mapping of the country was continued by the students of A.P.Karpinskyi and, above all, the future academician D.V.Nalivkin, who presented the Geological Map of the USSR at the session of the International Geological Congress in Moscow in 1937.

An idea of the role played by teachers and students of the Mining Institute in the activities of the Geological Committee is given by the following data: in 1924, out of 67 geologists who worked in the Geological Committee, 44 were mining engineers who graduated from the Mining Institute. More than 90 % of geologist students worked in the Geological Committee first as interns, and later as heads of independent parties. The connection of the Geological Committee with the Mining Institute was so close during these years and their scientific achievements are so inseparable from each other that Professor A.N.Ryabinin wrote: "To list these achievements, both practical and scientific, would mean to deal with scientific achievements equally of both the Mining Institute and the Geological Committee" [13, p. 79-80]. In other words, a line from the famous poem by V.Mayakovskyi is quite applicable to the assessment of the role played by the Mining Institute in the activities of the Geological Committee. After replacing two words, it will sound like this: "We say Geolcom, we mean Mining Institute".

One of the initiators of the creation of the Russian (later – All-Union) Paleontological Society in 1916 was the head of the Department of Paleontology of the Mining Institute N.N.Yakovlev. He became its first chairman and held this position until 1940.

There is no place on the maps of the Russian Empire, the Soviet Union, where scientists of the Mining Institute would not conduct geological research. For example, Professor of the Mining Institute L.I.Lutugin (1864-1915), who taught a course in historical geology (1897-1907), for 22 years (since 1892) was engaged in the study of the geological structure of the Donetsk coal basin. He created a new direction of these studies, called the Donetsk school. In the last years of his life, L.I.Lutugin organized 4 exploration and geological parties in Kuzbass, proving the presence of powerful coal reserves in this region.

In the second half of the XIX century – the beginning of the XX century in the western provinces of Russia – Privislinsky Krai or the Kingdom of Poland, scientists of the Mining Institute took an active part in the technological modernization of Polish metallurgical enterprises [32].

If in 1927 only 19 exploration parties were operating throughout the USSR, by 1932 there were 216 of them, in 1934 – 408, in 1937 – 877. Geologists, graduates of the Mining Institute, worked in all parties. Thanks to their efforts, more than 15 thousand mineral deposits were discovered in the country only during the first 50 years of Soviet power [33].

During the years of Soviet power, scientists of the Mining Institute created large research centers. In 1920, on the basis of the design bureau founded in 1916 by Professor G.O.Chechott, the All-Union Institute for Mechanical Processing of Minerals (Mechanobr) was established, which in 1922 was headed by a graduate of the Institute in 1918, future Professor S.E.Andreev. In 1923, by the decree of the Council of People's Commissars, through the works of mainly V.I.Bauman, the Institute of Applied Geophysics was organized at the Mining Institute, in whose works many professors and teachers took part. The founder and first director of the Institute of Physico-Chemical Analysis of the USSR Academy of Sciences was academician N.S.Kurnakov. The Institute's work was carried out in the LMI chemical laboratory. In 1932, on the initiative of the head of the Department of Surveying Art, Professor I.M.Bakhurin, the All-Union Surveying Institute (VNIMI) was founded.

In 1926, on the initiative of the Department of Metallurgy of the Leningrad Mining Institute, the world's first State Institute for the Design of Metallurgical Plants, Gipromez, was organized, headed by Professor V.N.Lipin. Over the course of several years, the works of metallurgists at LMI, headed by Professor N.P.Aseev, created the research and design institutes Giprotsvetmet (1930), Lengintsvetmet (1931), which was later transformed into the All-Union Aluminum-Magnesium Institute (VAMI), Gipronikel (1934), etc. At the same time, a special research “Nickel Group” was organized at the Mining Institute (N.P.Aseev, N.S.Greyver, K.F.Beloglazov, I.N.Maslenitskyi), whose task was to develop a technology for processing sulfide copper-nickel ores of the Kola Peninsula and Norilsk to produce nickel, copper, cobalt and platinum metal concentrate [34].

Thanks to the active participation of scientists of the Mining Institute, educational and scientific institutions have emerged in many regions of the USSR, which served as the birth of new mining and geological schools in the Urals, Donbass, Siberia and other mining regions of the country.

Not a single branch of the mining industry was created or developed without the direct participation of scientists and students of the LMI. The largest giants of Stalin's five-year plans – Magnitogorsk, Monchegorsk, Khibiny, Kuznetsk Metallurgical Combine, Severonikel and many others were designed and put into operation with the participation of scientists and graduates of the Institute. It is no coincidence that 18 graduates of the Mining Institute in the Soviet period were awarded the title of Hero of Socialist Labor – the highest degree of distinction for their work in the USSR. V.A.Tsaregradskyi (1944), who in the war and post-war years was the head of the Geological Exploration Department of Dalstroy (Kolyma), opens this honorary list. After him, V.A.Obruchev (1945), M.A.Pavlov (1945), N.A.Zaitsev (1948), V.S.Fadeev (1948), S.P.Alexandrov (1949), A.A.Skochinsky (1954), D.V.Nalivkin (1963), P.V.Golovach received a high award (1966), D.S.Korzhinskyi (1969), V.K.Egorov (1971), A.P.Markovsky (1971), N.P.Mashyanov (1971), V.I.Yavorskyi (1971), N.A.Shilo (1973), T.G.Desyatkin (1976), V.S.Sobolev (1978), P.I.Melnikov (1984).

Scientists, graduates of the Mining Institute played a huge role in the creation and development of scientific schools: crystallography, mineralogy and petrography (N.I.Koksharov, E.S.Fedorov, A.K.Boldyrev, A.N.Zavaritsky, D.S.Korzhinsky, I.I.Shafranovsky, D.P.Grigoriev, today – Yu.B.Marin,

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M.A.Ivanov), tectonic (M.M.Tetyaev, Yu.M.Sheinmann, L.I.Krasny), metallogenic (Yu.A.Bilibin, P.M.Tatarinov, V.I.Serpukhov, S.S.Smirnov, Yu.A.Zhemchuzhnikov, I.I.Gorsky, V.I.Ternovoy), hydrogeological (P.I.Butov, N.N.Slavyanov, N.I.Tolstikhin, N.F.Pogrebov, R.E.Dashko), geophysical (L.Ya.Nesterov, A.A.Logachev, B.A.Andreev), radioactive methods (Yu.N.Kapkov), oil worker (G.D.Romanovsky, K.I.Bogdanovich, I.M.Gubkin, S.I.Mironov, A.P.Krylov, B.A.Alferov).

The school of metallurgists has long and rich traditions (G.A.Iossa, V.E.Grum-Grzhimailo, N.S.Kurnakov, M.A.Pavlov, N.P.Aseev, V.N.Lipin, A.N.Kuznetsov, T.A.Obolduev, P.Ya.Saldau, K.F.Beloglazov, I.N.Maslenitsky, I.N.Piskunov, N.S.Greyver), which is represented today by professors V.Yu.Bazhin, V.N.Brichkin, V.M.Sizyakov.

In 1920-1930, a scientific school for the development of deposits of solid minerals was formed, the founding fathers of which were Professor B.I.Bokiy and his student Professor V.D.Slesarev. The heirs and successors of their work were professors A.A.Borisov, Yu.D.Dyadkin, A.I.Arsentiev, N.M.Proskuryakov, and others. Within the framework of this school, several directions have been formed. For example, the works of Professors N.D.Kotsovsky and A.A.Skochinsky initiated one of the priorities – mine aerodynamics and mining safety. Among those who have made a significant contribution to the development of this direction, professors V.B.Komarov, P.I.Mustel, I.I.Medvedev, Yu.V.Shuvalov, G.I.Korshunov, S.G.Gendler should be noted. Prominent representatives of the scientific direction of managing the processes of destruction of a rock mass by the energy of an explosion were professors A.N.Hanukaev, Yu.M.Misnik, associate professors A.F.Vaipolin, M.A.Nefedov.

In the early 1990s, a scientific school of geoecology was established, the founder and head of which was Professor M.A.Pashkevich.

Professor A.V.Kozlov has been the head of the scientific school of Regional geology and conditions of formation of mineral deposits for many years.

At the origins of the scientific school of geomechanics and underground construction was Professor B.V.Bokiy (1893-1973), the initiator of the creation of the Department of Construction of Mining Enterprises and Underground structures at LMI. Professors V.D.Slesarev, V.N.Semevsky, N.S.Bulychev, G.G.Mirzaev, V.V.Smirnyakov, A.N.Stavrogin, A.G.Protosenya, V.L.Trushko made a great contribution to the development of the school.

The founders of the scientific surveying and geodesic school are Professor V.I.Bauman and corresponding member of the USSR Academy of Sciences I.M.Bakhurin. From 1923 to 1965, the Department of Geodesy was headed by Corresponding member of the USSR Academy of Sciences N.G.Kell (1883-1966), on whose initiative and direct participation in 1925-1928, a unified state system of rectangular coordinates based on the conformal Gauss-Kruger projection was adopted [35]. Prominent representatives of this school were professors S.G.Avershin, D.A.Kazakovsky [36], I.N.Ushakov, L.N.Kell (rector of LMI in 1963-1978), V.G.Zdanovich.

At the beginning of the XX century, geocryology (permafrost study) developed as a branch of engineering geology, but already in 1925-1930, it became an independent science, the formation of which is associated with the names of Russian and Soviet scientists, graduates of the Mining Institute – V.A.Obruchev, P.I.Butov and P.I.Melnikov [37].

The scientific school “Drilling wells in complicated conditions” appeared almost simultaneously with the creation of the Department of Exploration Technology (later – “Department of Technology and Techniques of Drilling Wells”) in 1949. The initiator of its creation was Professor F.A.Shamshev (1893-1979). A graduate of the Donetsk Polytechnic Institute, he began working at the Mining Institute in 1931, where under his leadership, research was successfully conducted in the field of drilling wells in complicated conditions. At the same time, he organized a diamond drilling laboratory in All-Union Scientific Research Institute of Methods and Exploration Techniques. A huge contribution to the development of the school of drilling geologists was made by the legendary drilling scientist, Professor B.B.Kudryashov (1931-2002). From 1967 to 2002, he was the permanent head of Soviet and Russian scientific research in the field of drilling wells in ice, a participant in Soviet Antarctic expeditions. The drilling complex of the Vostok polar station is named after him today. On February 5, 2012, specialists of the glacio-drilling detachment of the 57th Russian Antarctic Expedition led by

Professor of the Mining University N.I.Vasiliev (1948-2021) were able to drill 3,769 meters of Antarctic ice in an environmentally friendly way and reached the subglacial Lake Vostok, which had been hiding from the world for almost 15 million years [38]. Today, the relevance of this scientific school cannot be overestimated, since the needs of the modern Russian economy require the search and development of oil and gas fields located in areas with difficult climatic and mining-geological conditions [39, p. 113-114].

An indisputable contribution to the formation and development of the scientific school of the Faculty of Economics "Rational Subsoil Use" was made by prominent scientists and specialists in the organization of production in the mineral resource complex – professors O.B.Bokiy, B.B.Evangulov, N.V.Pashkevich, E.A.Solovyova, N.Ya.Lobanov, V.S.Litvinenko.

Currently, the creative efforts of Mining University scientists are focused on thirteen areas of scientific development. Six research centers have been created at Mining University: Problems of processing mineral and man-made resources; Geomechanics and mining issues; Assessment of technogenic transformation of ecosystems (Research center "Ecosystem"); Research center "Arctic"; Center of Digital Technologies; Research center "Earth Science".

The Jubilee "dossier" of the Mining University contains an even more impressive list of those scientists, specialists of the mineral resource complex, who over the past century have become laureates of prestigious State awards for their contribution to the development of science and technology, for Merit to the Fatherland. There are 177 names in this list, of which 78 are winners of the Stalin Prize, 31 of the Lenin Prize, 50 of the USSR State Prize, 10 of the USSR Council of Ministers (Government) Prize, 10 of the Russian Federation State Prize and 24 of the RF Government Prize. Among them, we note three-time prize winners, academicians of the USSR Academy of Sciences: I.S.Gramberg, a major organizer of the Geological Survey of Russia (State Prizes of the USSR and the Russian Federation in 1983, 1995 and the Prize of the Government of the Russian Federation in 2002), A.N.Zavaritsky, an outstanding geologist, specialist in petrography and ore deposits (Stalin Prize in 1943, 1946 and Lenin Prize in 1958), D.S.Korzhinsky, a major specialist in the field of petrography, geochemistry and geology of ore deposits (Stalin Prize 1946, Lenin Prize 1958, State USSR Prize1975) [40].

34 miners, geologists, metallurgists were twice awarded state prizes for achievements in science and technology: S.G.Avershin (1948, 1971), N.P.Aseev (1942, 1946), S.D.Batishchev-Tarasov (1951, 1957), A.G.Betekhtin (1947, 1958), F.M.Brekhovskikh (1946, 1953), N.S.Bulychev (1984, 1995), A.P.Burov (1952, 1957), G.P.Volarovich (1946, 1950), Yu.N.Godin (1951, 1962), N.S.Greyver (1942, 1946), N.L.Dobretsov (1976, 1997), A.S.Zavyalov (1942, 1951), L.P.Zarogatsky (1990, 2009), V.N.Zemisev (1984, 1999), A.A.Kozyrev (1989, 2000), G.D.Krasnov (1983, 1991), L.I.Krasny (1964, 1991), A.P.Krylov (1949, 1962), F.A.Kupriyanov (1950, 1966), V.S.Litvinenko (2001, 2008), G.Ts.Medoev (1948, 1958), V.G.Melkov (1951, 1965), D.V.Nalivkin (1946, 1957), V.A.Obruchev (1941, 1950), A.N.Omelchenko (1952, 1971), M.A.Pavlov (1943, 1947), N.N.Puzyrev (1987, 1999), M.A.Revazov (1982, 1986), I.S.Rozhkov (1950, 1951), D.V.Rundquist (1983, 2013), A.I.Semenov, A.A.Skochinsky (1950, 1951), V.S.Sobolev (1950, 1976), E.T.Shatalov (1946, 1950).

One of the important indicators of the scientific activity of the university are the results of the dissertation councils. The decision of the Council of People's Commissars of the USSR N 79 of January 13, 1934 approved the academic degrees of Doctor and Candidate of Sciences. Unfortunately, complete information about the number of defended dissertations at the LMI in the pre-war period has not been found. In addition, in the second half of the 1930s, taking into account the contribution of scientists of the Mining Institute to the development of mining sciences, their discoveries, the degree of Doctor of sciences, as a rule, was awarded to them without defending dissertations.

In 1925, a postgraduate course was opened at the Leningrad Mining Institute. In 1927, 11 graduate students were engaged in science (all of them worked in the field of metallurgy and enrichment), in 1932 – 62 [13, p. 83], in 1940 – 108.

The exact data on the number of dissertations defended by the staff of the Scientific Council of the LMI have been recorded in special Books since 1943. At that time, LMI was in evacuation in the city of Cheremkhovo (Irkutsk region), but scientific activity at the institute did not stop. In 1943 and 1944,

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the Council accepted 12 candidate and 5 doctoral dissertations for defense[4]. Scientists of the Mining Institute conducted scientific research during these years, which had great theoretical and practical defense significance.

The number of dissertation defenses that have passed through the Councils for Awarding Academic Degrees at the Mining Institute, according to five-year plans are presented in Tables 5, 6.

Table 5

Defense of dissertations in 1943-1989

Years	Total defended dissertations	Of which, doctoral dissertations	Doctor of Engineering Sciences	Doctor of Geological and Mineralogical Sciences
1943-1949	98	17	11	6
1950-1954	201	27	14	13
1955-1959	193	22	15	7
1960-1964	295	38	26	12
1965-1969	497	48	32	16
1970-1974	608	62	44	18
1975-1979	408	38	24	14
1980-1984	430	36	21	15
1985-1989	383	50	29	21
Total:	3113	338	216	122

Note. The table is based on the materials of the Book of Registrations of dissertations that passed through the Academic Council of the Leningrad Mining Institute – Book 1 (1943-1967), Book 2 (1968-1983), Book 3 (1983-2000).

In this more than 50-year period, the peak of the work of the LMI dissertation councils falls at the end of the 1960s – the first half of the 1970s. The year of 1969 was especially mast year for defense – 136 defended dissertations, of which 11 were doctoral. At that time, applicants from all over the USSR defended themselves in 7 Councils for awarding academic degrees – the geography of dissertants was very extensive. In June 1974, stating the sharply increased number of defenses and admitting "the possibility of leakage of not very high-quality works," the Vice-rector for Scientific Work, Professor I.I.Medvedev noted that in the State Commission for Academic Degrees and Titles, the work of the LMI Councils on awarding academic degrees was assessed as "very good" [12, Op. 10. D. 293. L. 31].

Table 6

Defense of dissertations in 1990-2022

Years	Total defended dissertations	Of which, doctoral dissertations	Doctor of Engineering Sciences	Doctor of Geological and Mineralogical Sciences	Doctor of Economics
1990-1994	315	80	51	26	3
1995-1999	206	54	43	7	4
2000-2004	243	45	32	8	4
2005-2009	242	17	9	5	3
2010-2014	395	20	13	5	2
2015-2019	334	14	11	3	-
2020-2022	190	11	9	1	1
Total:	1925	241	168	55	17

Note. The table is based on the materials of the Book of Registrations of dissertations that passed through the Academic Council of the Leningrad Mining Institute. Book 4 (1983-2017); Archive of the Academic Council of Saint Petersburg Mining University.

According to the Order of the Government of the Russian Federation dated August 23, 2017, Saint Petersburg Mining University received the right on independently award academic degrees. Over

[4] Book of Registrations of dissertations that passed through the Academic Council of the Leningrad Mining Institute. Book 1 (1943-1967).

the last quarter of a century (1998-2022), 1516 dissertations (142 doctoral) were defended at the Mining University, of which 1190 dissertations were defended by university staff and graduate students, including 62 doctoral ones.

Thus, 5038 dissertations, including 579 doctoral dissertations, have been performed within the walls of the Mining University for 80 years.

For outstanding achievements in the field of training personnel for geology, mining, metallurgy and the development of science, the Leningrad Mining Institute was awarded the highest awards of the USSR – the Order of Lenin in 1944, the Order of the Red Banner of Labor in 1948, the Order of the October Revolution – in 1973. On July 30, 1996, by Decree of the President of Russia, the Saint Petersburg Mining Institute was included in the State Code of especially valuable objects of cultural heritage of the peoples of the Russian Federation. In November 2009, the Mining University was awarded the category "National Research University".

Conclusion. Today, Catherine II Saint Petersburg Mining University is a unique educational and research institution with its own scientific schools and rich traditions in personnel training in the field of geology, mining, metallurgy, mining industrial and civil engineering, mining electric engineering, oil and gas business, industrial safety, industrial economics and geoecology for mineral and raw materials complex. The Mining University is still the flagship of mining education in Russia and occupies the highest places in international rankings.

In 2023, a historic event took place – the Mining University took the third place in the world among the best universities in the direction of Mineral and Mining Engineering. No Russian university has ever managed anything like this before. Such successes have become possible thanks to the scientific accomplishments of the scientific community of the Mining University, achieved over the past 30 years of its recent history, and the organizational talents of the leadership. This page of the history of the oldest technical university in the country is worthy of a separate study.

Today the Mining University faces new challenges related to the global challenges of the world economy, as "recently, public discussion has intensified regarding the way to further socio-economic structure of the world economy, taking into account the great dynamics in the raw materials market, especially in the hydrocarbon raw materials market." At the same time, "the public opinion of all countries is united in the fact that raw materials are the basis for the development of our and future civilizations" [41, p. 103, 107].

This is all the more relevant for Russia, since mining, the fuel and energy complex continue to be the most important part of the Russian economy. The implementation of the government's "Strategy for the development of the mineral resource base of the Russian Federation until 2035", a resource-innovative development option that allows "connecting the natural-resource potential of Russia with the latest technologies" [42] depends on the availability of highly qualified personnel. Therefore, the Mining University today, preserving the traditions of the past and multiplying achievements, writes the history of the XXI century, understanding the responsible mission assigned to it – in the process of solving the urgent task of creating a sovereign economy of Russia, to train highly qualified specialists for the mineral resource complex of the country, "to look for new ways leading to increasing the sustainability of the mining industry" [41, p. 108]. New generations of Mining University students should be not just specialists, but patriots of their work, increasing the authority of the profession of a geologist, miner, metallurgist, constructor, guided by the words from the first charter of the Mining School: "Zeal for the service of the Fatherland and for the benefit of its love."

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