

Tashkulova Shakhnoza

Doctoral Student (Researcher) specializing in “History of Uzbekistan” at Tashkent State Technical University named after Islam Karimov

E-mail. shahnoza.toshqulova@gmail.com

<https://orcid.org/0009-0005-3743-0842>

THE SIGNIFICANCE OF ACADEMICIAN VAKHOB RAKHIMOV'S SCIENTIFIC SCHOOL IN THE FIELDS OF MINE SURVEYING AND MINING

Annotation

This study provides a comprehensive academic analysis of the multifaceted scholarly, pedagogical, organizational, and engineering career of Academician Vakhob Rakhimovich Rakhimov – Doctor of Technical Sciences, Professor, and Full Member of the Academy of Sciences of the Republic of Uzbekistan – as well as the fundamental significance of the mining and mine surveying school he pioneered. Over the course of his distinguished career, the scholar established a groundbreaking scientific paradigm focused on investigating the dynamics of geomechanical processes within rock masses, substantiating optimal deposit opening and extraction schemes under tectonic stress fields, and calculating the structural parameters of room-and-pillar mining systems.

The paper demonstrates that the methodological frameworks and innovative technologies engineered by Academician V.R. Rakhimov were successfully integrated across major ore deposits in Uzbekistan, Kazakhstan, Belarus, and other nations (notably Ingichka, Qoytosh, Mirgalimsay, Zhezkazgan, Soligorsk, and Muruntov), significantly reducing mineral losses and ore dilution within retaining pillars. Furthermore, the study highlights his pioneering practical solutions, including bench slope profiling via slot (contour) blasting, preliminary slope reinforcement, and the real-time online monitoring of liquid mine tailings utilizing electro-optical instrumentation and satellite navigation (GPS) technologies.

The research illuminates V.Rakhimov's invaluable contribution to bridging specialized higher education and industrial production at Tashkent State Technical University, where he served for more than 40 years as Head of the Department of Mine Surveying and Geodesy, 18 years as Dean of the Faculty, and 7 years as First Vice-Rector. Under his scientific supervision, 3 Doctors of Sciences and more than 50 Candidates of Sciences were mentored, shaping a premier constellation of industry specialists. In conclusion, it is scientifically synthesized that Academician V.R. Rakhimov's legacy of over 300 scholarly publications and his enduring academic school continue to serve as a bedrock for the safe, rational, and sustainable advancement of the national mining industry.

Key words: Academician Vakhob Rakhimov; mine surveying; mining geomechanics; scientific school; room-and-pillar system; rock mass; rock pressure dynamics; slot blasting; human capital and education; industrial integration.

Тошқұлова Шахноза

Ислам Кәрімов атындағы Ташкент мемлекеттік техникалық университетінің
«Өзбекстан тарихы» мамандығы бойынша базалық докторанты (PhD)

E-mail. shahnoza.toshqulova@gmail.com

<https://orcid.org/0009-0005-3743-0842>

**АКАДЕМИК ВАХОБ РАХИМОВТЫҢ МАРКШЕЙДЕРИЯ ЖӘНЕ ТАУ-КЕН ІСІ
САЛАСЫНДАҒЫ ҒЫЛЫМИ МЕКТЕБІНІҢ МАҢЫЗЫ**

Аңдатпа

Бұл зерттеу жұмысында Өзбекстан Республикасы Ғылым академиясының академигі, техника ғылымдарының докторы, профессор Вахоб Рахимович Рахимовтың сан қырлы ғылыми-педагогикалық, ұйымдастырушылық және инженерлік қызметі, сондай-ақ ол негізін қалаған тау-кен және маркшейдерлік ғылыми мектебінің іргелі мәні жан-жақты талданады. Ғалым өзінің еңбек жолында тау жыныстары массивіндегі геомеханикалық процестер динамикасын зерттеу, тектоникалық кернеу өрістерін ескере отырып кен орындарын ашу мен қазып алудың оңтайлы сызбаларын негіздеу және камералық-бағаналы жүйелердің құрылымдық параметрлерін есептеу бойынша жаңа ғылыми бағыттың іргетасын қалады.

Мақалада академик В.Р. Рахимов жасақтаған әдістемелік әзірлемелер мен инновациялық технологиялардың Өзбекстан, Қазақстан, Беларусь және басқа да шет мемлекеттердің ірі кен орындарында (атап айтқанда, Ингичка, Қойтас, Мырғалымсай, Жезқазған, Солигорск, Мұрынтау) сәтті енгізіліп, тіреуіш блоктарда (целиктерде) кен шығыны мен құнсыздануын айтарлықтай азайтуға қызмет еткені ғылыми тұрғыдан дәйектелген. Сонымен қатар, ғалымның саңылаулы жару әдісі арқылы карьер кертпештерін құламалау (заоткоска), оларды алдын ала бекіту және электронды-оптикалық аспаптар мен жерсеріктік (GPS) жүйелер арқылы сұйық қалдықтарды онлайн режимінде мониторингілеу секілді озық қолданбалы шешімдері жария етілген.

Зерттеуде В.Р. Рахимовтың Ташкент мемлекеттік техникалық университетінде 40 жылдан астам уақыт бойы «Маркшейдерлік іс және геодезия» кафедрасының меңгерушісі, 18 жыл факультет деканы және 7 жыл бірінші проректор ретінде салалық білім мен өндірістің интеграциясын қамтамасыз етуге қосқан өлшеусіз үлесі көрсетілген. Оның ғылыми жетекшілігімен 3 ғылым докторы және 50-ден астам ғылым кандидаты даярланып, жетекші мамандар шоғыры қалыптасты. Қорытынды ретінде, академик В.Р. Рахимовтың 300-ден астам ғылыми еңбегі мен ғылыми мектебі бүгінгі таңда да ұлттық тау-кен өнеркәсібін қауіпсіз әрі тұрақты дамытудың, қойнау байлығын ұтымды пайдаланудың басты іргетасы болып табылатыны тұжырымдалған.

Түйін сөздер: Академик Вахоб Рахимов; маркшейдерлік іс; тау-кен геомеханикасы; ғылыми мектеп; камералық-бағаналы жүйе; тау жыныстары массиві; тау қысымының динамикасы; саңылаулы жару; адами капитал және білім беру; өндірістік интеграция.

Тошқулова Шахноза

Базовый докторант (PhD) специальности «История Узбекистана» Ташкентского государственного технического университета имени Ислама Каримова

E-mail. shahnoza.toshqulova@gmail.com

<https://orcid.org/0009-0005-3743-0842>

ЗНАЧЕНИЕ НАУЧНОЙ ШКОЛЫ АКАДЕМИКА ВАХОБА РАХИМОВА В ОБЛАСТИ МАРКШЕЙДЕРСКОГО ДЕЛА И ГОРНОГО ДЕЛА

Аннотация

В данном исследовании представлен всесторонний научный анализ многогранной научно-педагогической, организаторской и инженерной деятельности академика Академии наук Республики Узбекистан, доктора технических наук, профессора Вахоба Рахимовича Рахимова, а также фундаментального значения созданной им научной школы в области горного дела и маркшейдерии. На протяжении своей трудовой деятельности ученый заложил основы нового научного направления, ориентированного на исследование динамики геомеханических процессов в массиве горных пород, обоснование рациональных схем вскрытия, подготовки и отработки месторождений с учетом полей тектонических напряжений, а также расчет конструктивных параметров камерно-столбовой системы разработки.

В статье обосновано, что разработанные академиком В.Р. Рахимовым методические рекомендации и инновационные технологии были успешно внедрены на крупных рудных

месторождениях Узбекистана, Казахстана, Беларуси и других стран (в частности, Ингичка, Койташ, Миргалимсай, Жезказган, Солигорск, Мурунтау), что способствовало существенному снижению потерь и разубоживания руды в целиках. Кроме того, освещены такие передовые инженерные решения ученого, как заоткоска уступов карьеров с применением целевого взрывания, их предварительное упрочнение, а также организация оперативного онлайн-мониторинга хвостохранилищ жидких отходов с использованием электронно-оптических приборов и систем спутниковой навигации (GPS).

В исследовании показан неоценимый вклад В.Р. Рахимова в обеспечение интеграции отраслевого образования и производства в Ташкентском государственном техническом университете, где он на протяжении более 40 лет заведовал кафедрой «Маркшейдерское дело и геодезия», 18 лет являлся деканом факультета и 7 лет работал первым проректором. Под его непосредственным научным руководством были подготовлены 3 доктора наук и свыше 50 кандидатов наук, составивших плеяду ведущих специалистов отрасли. В заключении научно обобщено, что созданная научная школа и более 300 научных трудов академика В.Р. Рахимова и сегодня служат прочным теоретическим и прикладным фундаментом для безопасного и устойчивого развития горнодобывающей промышленности республики.

Ключевые слова: Академик Вахоб Рахимов; маркшейдерское дело; горная геомеханика; научная школа; камерно-столбовая система; массив горных пород; динамика горного давления; целевое взрывание; человеческий капитал и образование; промышленная интеграция.

Tashkulova Shakhnoza

İslam Kerimov adındaki Taşkent Devlet Teknik Üniversitesi, “Özbekistan Tarihi” Bölümü

Doktora Öğrencisi (Araştırmacı)

E-posta: shahnoza.toshqulova@gmail.com

<https://orcid.org/0009-0005-3743-0842>

AKADEMİSYEN VAHOB RAHIMOV’UN MARKŞEYDERLİK VE MADENCİLİK ALANINDAKİ BİLİMSEL EKOLÜNÜN ÖNEMİ

Özet

Bu araştırmada, Özbekistan Cumhuriyeti Bilimler Akademisi Asli Üyesi (Akademisyen), Teknik Bilimler Doktoru, Profesör Vahob Rahimoviç Rahimov'un çok yönlü bilimsel, pedagojik, idari ve mühendislik faaliyetleri ile kurucusu olduğu madencilik ve maden ölçme (markşeyderi) bilim ekolünün temel önemi ayrıntılı biçimde incelenmektedir. Bilim insanı, mesleki kariyeri boyunca kaya kütleindeki jeomekanik süreçlerin dinamiklerini araştırmak, tektonik gerilme alanlarını dikkate alarak maden yataklarının açılması ve işletilmesine yönelik rasyonel planları gerekçelendirmek ve oda-topuk madencilik yönteminin yapısal parametrelerini hesaplamak üzerine yeni bir bilimsel disiplinin temellerini atmıştır.

Makalede, Akademisyen V.R. Rahimov tarafından geliştirilen metodolojik yönergelerin ve yenilikçi teknolojilerin Özbekistan, Kazakistan, Belarus ve diğer ülkelerdeki büyük maden yataklarında (özellikle İngiçka, Koytaş, Mirgalimsay, Jezkazgan, Soligorsk, Muruntav) başarıyla uygulandığı, koruyucu topuklarda cevher kaybını ve seyrelmesini belirgin ölçüde azalttığı ortaya konmuştur. Ayrıca bilim insanının açık ocak basamaklarının yarık (kontur) patlatma yöntemiyle şevlendirilmesi, basamakların önceden tahkim edilmesi ve sıvı maden atık depolama tesislerinin elektro-optik aletler ile uydu (GPS) sistemleri vasıtasıyla gerçek zamanlı (çevrim içi) izlenmesi gibi öncü mühendislik çözümleri ele alınmıştır.

Araştırmada, V.R. Rahimov’un Taşkent Devlet Teknik Üniversitesi bünyesinde 40 yılı aşkın bir süre «Maden Ölçme ve Jeodezi» Bölüm Başkanlığı, 18 yıl Fakülte Dekanlığı ve 7 yıl Birinci Rektör Yardımcılığı görevlerinde bulunarak sektörel yükseköğretim ve sanayi entegrasyonunu sağlamadaki benzersiz katkısı gösterilmiştir. Kendisinin bilimsel danışmanlığında 3 bilim doktoru ve 50'den fazla bilim adayı yetiştirilerek sektörün öncü uzmanlar topluluğu teşekkül ettirilmiştir.

Sonuç olarak, Akademisyen V.R. Rahimov'un 300'ü aşkın bilimsel yayını ve bilimsel okulunun, bugün de milli madencilik sanayisinin güvenli, rasyonel ve sürdürülebilir gelişiminde vazgeçilmez bir temel oluşturduğu bilimsel olarak özetlenmiştir.

Anahtar Kelimeler: Akademisyen Vahob Rahimov; maden ölçme (markşeyderi); maden jeomekaniği; bilim okulu; oda-topuk sistemi; kaya kütlesi; kaya basıncı dinamikleri; yarık patlatma; beşerî sermaye ve eğitim; sanayi entegrasyonu.

Introduction

Uzbekistan is an endowment-rich country where the mining sector has historically served as a critical driver of socio-economic and cultural advancement. Particularly during the post-independence era, scientific research has played a decisive role in establishing contemporary, evidence-based foundations for the modernization and sustainable growth of the mining industry. In this process, the profound contribution of Academician Vakhob Rakhimov and the scientific school established around him warrants particular scholarly attention. This section examines the theoretical and applied contributions of Academician Vakhob Rakhimov to mining engineering and mine surveying, analyzing the enduring impact of his school's research on the sector.

The mining industry has consistently constituted one of the foundational pillars of Uzbekistan's economic architecture. Today, the sector has attained an advanced level of technological maturity through the strategic synthesis of rich mineral reserves, centuries-old mining traditions, and cutting-edge scientific methodology. The academic school founded by Academician Vakhob Rakhimov has made an exceptional contribution to this progress. The school he established has not only advanced fundamental research, but has also systematically enhanced the operational efficiency of practical mining operations – a legacy that continues to exert a vital influence today.

Within the wider scientific community, Academician Vakhob Rakhimovich Rakhimov is widely recognized as a distinguished geologist, geochemist, eminent specialist in mine surveying, and preeminent authority in mining geomechanics. His scholarly endeavors were predominantly devoted to the geological exploration, evaluation, and scientifically grounded exploitation of mineral deposits. Specifically, his research centered on mineral extraction technologies, advanced mine surveying, and rock mass geomechanics. Under his supervision, methodological guidelines for ensuring mining operational safety and calculating the structural parameters of room-and-pillar mining systems were widely adopted in the technological design of numerous ore deposits across Uzbekistan, Kazakhstan, and Belarus, where they remain successfully utilized today. The scientific school pioneered by Vakhob Rakhimov has played a pivotal role in formulating modern scientific methodologies and integrating them into industrial practice across the mining and geological sectors [1.51].

Vakhob Rakhimov is recognized as an eminent scholar in mining engineering, the principal organizer of professional training for mine surveying engineers across Uzbekistan and Central Asia at Tashkent State Technical University, and one of the founders of the academic school in mining and mine surveying. His multifaceted scientific work was centered on formulating both the theoretical framework and engineering practice of geomechanical processes occurring within rock masses during open-pit, underground, and borehole mining operations.

Doctor of Technical Sciences, Professor, and Academician of the Academy of Sciences of the Republic of Uzbekistan, Vakhob Rakhimovich Rakhimov was born on December 26, 1934, in the city of Samarkand. In 1952, having graduated from secondary school with a gold medal, he matriculated into the Faculty of Mining at the Central Asian Polytechnic Institute (currently the Tashkent State Technical University named after Islam Karimov). In 1957, he graduated from the institute with honors in the specialization of "Exploitation of Mineral Deposits", earning the professional qualification of Mining Engineer [2.131].

In 1957, Vakhob Rakhimov commenced his professional career as a research fellow in the Mining Division of the Academy of Sciences of Uzbekistan, where the young engineer continued his investigations into rock pressure phenomena in Central Asian mines-research he had initially embarked upon during his student years [3.114]. Thus began his distinguished, nearly six-decade-

long academic career, which saw him advance from an entry-level researcher to Full Professor, Head of Department, Dean of the Faculty, and First Vice-Rector of the University [4.303-304].

Methodology.

The mine surveying service plays a vital role and holds profound strategic significance in governing geotechnological processes to ensure the sustainable advancement of the mining industry in the Republic of Uzbekistan. Elucidating the foundational historical contributions of Academician Vakhob Rakhimov - who played an instrumental role in shaping mine surveying as a distinct scientific discipline – together with the enduring relevance of his academic school to sovereign Uzbekistan, constitutes a highly pertinent scholarly inquiry today. Furthermore, there is an imperative to systematically characterize the broader contributions of the Uzbek mining engineering school, particularly the legacy of prominent scholars such as Academician Vakhob Rakhimov, in advancing theoretical science, cultivating national engineering cadres, and generating pivotal empirical discoveries.

Within the national mining community, Academician Vakhob Rakhimov has always been revered as a monumental mining scholar whose prolific endeavors propelled the mining sciences forward. Throughout his career, he spearheaded vital research trajectories in geomechanics, extraction technologies, and the integrated, sustainable exploitation of subsurface mineral and fuel-energy resources [5.4].

In 1959, he was admitted to postgraduate studies (aspirantura) at the Academician A.A. Skochinsky Institute of Mining in Moscow. Under the academic supervision of Professor K.V. Ruppeneyt [6], he advanced his investigations into rock pressure dynamics and strata displacement, methodically developing and successfully defending in 1962 his candidate dissertation entitled “Investigation of Load Distribution Between Solid Pillars in Room-and-Pillar Mining Systems” [7].

Following the successful defense of his dissertation in Moscow, Vakhob Rakhimov served as a Senior Research Fellow at the Central Asian Research and Design Institute of Non-Ferrous Metallurgy (“SredazNIIprotsvetmet”) between 1962 and 1963. During the Soviet period, SredazNIIprotsvetmet was one of the largest scientific and technological centers serving the regional mining and metallurgical industry. Established in the mid-twentieth century with primary facilities located in Tashkent and Almalyk (Tashkent Region), the institute spearheaded the development, exploitation, and infrastructure engineering design of non-ferrous and rare metal deposits not only across Uzbekistan, but throughout Central Asia, including Tajikistan and Kyrgyzstan. For many years, it was directly subordinated to the USSR Ministry of Non-Ferrous Metallurgy. Today, the foundational scientific legacy and engineering functions of this institution are continued in Uzbekistan by modern research entities such as “UzgeorangmetLITI” (Uzbek Research and Design Institute of Geology, Mining, and Non-Ferrous Metallurgy).

The design of complex industrial facilities consistently required exhaustive structural-geological analysis and comprehensive evaluation of ore reserves. Consequently, the institute’s engineers relied heavily on the regional geological mapping, fundamental discoveries, and theoretical paradigms established by eminent geoscientists – most notably Academicians Khabibulla Akbarov and Vakhob Rakhimov, who made monumental contributions to Uzbekistan’s mining geology, Boris Nasledov, the founder of the Uzbek school of ore geology, as well as distinguished specialists such as U.K. Akhmedov and Natalya Solomko. Their seminal research served as an indispensable foundation for assessing the industrial viability of mineral deposits and devising rigorous, tailored technological solutions for SredazNIIprotsvetmet [8].

Having defended his candidate dissertation in Moscow, the young scholar returned to the Mining Division of the Academy of Sciences. Following the merger of this division with the Central Asian Research and Design Institute of Non-Ferrous Metallurgy (SredazNIIprotsvetmet), he served there as a Senior Research Fellow.

In 1964, Vakhob Rakhimov joined the Tashkent Polytechnic Institute (currently the Tashkent State Technical University named after Islam Karimov) as a Senior Lecturer in the Department of Mine Surveying and Geodesy, marking the start of his distinguished academic career. Shortly thereafter, in 1965, he was appointed Associate Professor (Docent). In 1968, he was elected Head of

the Department of Mine Surveying and Geodesy – a post he held with distinction for more than four decades [9]. In this leadership capacity, he guided generations of students toward professional excellence, remaining with the department until 2014, including service as Full Professor from 2010 to 2014 [3.114].

Concurrently, for eighteen years across two separate tenures (1968-1984 and 1995-1999), he served as Dean of the Faculty of Mining and Geology. During his deanship, systemic efforts were undertaken to modernize the faculty's pedagogical and experimental infrastructure while institutionalizing robust research cooperation with industrial mining enterprises [10.138].

Specifically, within the administration of the Tashkent Polytechnic Institute, Associate Professor (Docent) U.A. Ikramov served as Vice-Rector for Evening and Extramural Education from 1968, while Associate Professor V.I. Sverdlin headed the Academic Affairs Department beginning in 1970. During this formative era, the systematic modernization of the pedagogical process and the optimization of academic departments were propelled by the dedicated leadership of the faculty deans.

Prominent scholars instrumental in this institutional advancement included Professors V.R. Rakhimov, T.R. Abdurashidov, K.K. Kazakbayev, and Z.S. Ibragimov, alongside Associate Professors Kh.M. Asimov, M.T. Balabekov, T.Z. Zokirov, A.U. Ubaydullaev, F.N. Nazrullaev, T.N. Rakhimov, A.G. Karakozova, R.A. Obidov, N.B. Utkelbaev, Kh.G. Sarimsakov, A.K. Qahhorov, A.A. Odilkhodjaev, Kh.M. Ubaydullaev, I.I. Inoghomov, A.A. Sadredinov, Kh.N. Nuratdinov, A.A. Askarov, A.A. Abirov, N.Kh. Bozorov, K.B. Usmonov, P.Kh. Mansurov, Kh.V. Abdullaev, R.A. Nazirova, A.G. Egamberdiev, A.A. Khashimov, Kh.G. Karimov, Sh.M. Ashurov, S.S. Boltaev, A.I. Inoghomov, A.A. Samikjanov, I.A. Liverko, N.A. Yakubov, and many others. Their collective dedication, administrative rigor, and scholarly contributions remain an enduring and foundational chapter in the university's institutional history [11.106].

Main content.

During the early stages of his scholarly career, Vakhob Rakhimov focused predominantly on rock mass mechanics. Building on empirical research conducted across the mining operations of Uzbekistan, he defended his doctoral dissertation in 1972 at the Mining Institute of the USSR Academy of Sciences under the academic mentorship of Professor M.M. Protodyakonov (Jr.) [12]. His dissertation, titled “Investigation of Mechanical Processes in Rock Masses Under Room-and-Pillar Mining Systems”, was presented in the specialization of “Mine Surveying”, earning him the prestigious degree of Doctor of Technical Sciences [13], followed in 1973 by the conferral of the academic rank of Full Professor [14]. Defending a higher doctorate (Doctor of Sciences) at the renowned Moscow mining research school at the youthful age of only 37 stands as compelling testament to his exceptional intellectual and scientific stature.

Vakhob Rakhimov's multi-decade academic and pedagogical trajectory was extraordinarily prolific and impactful. His theoretical research in the 1970s on geomechanical processes within rock masses made a landmark contribution to both the foundational theory and applied engineering practice of optimizing structural parameters for room-and-pillar mining systems in the development of both metallic (ore) and non-metallic mineral deposits.

During the same decade, under the scientific leadership of Academician G.A. Mavlyanov, researchers from the Tashkent Polytechnic Institute, in collaboration with inter-institutional research teams, examined the engineering-geological characteristics of various loess soil formations and illuminated the fundamental regularities governing the hydrogeology and formation of groundwater resources across Uzbekistan. Concurrently, broader strategic problems aimed at maximizing mineral extraction efficiency and strata control were spearheaded at the Institute's Faculty of Mining and Metallurgy under the direct leadership of Professor Vakhob Rakhimov, earning distinguished national recognition [11.114].

Under his scientific supervision, engineering methodologies formulated for mineral extraction technologies, geomechanics, and the structural parameter optimization of room-and-pillar mining were comprehensively adopted in the operational design of major deposits, such as Ingichka, Qoytosh, Mirgalimsay, Zhezkazgan, Gaurdak, and Soligorsk. The deployment of these frameworks

markedly minimized ore loss and dilution within solid barrier pillars [2.131]. Through multi-year theoretical and experimental investigations, he elucidated the fundamental regularities governing the evolution of deformation processes within near-pit rock masses (slopes). Furthermore, he engineered and implemented an integrated method for open-pit bench slope profiling (zaotkoska) utilizing slot (pre-split/contour) blasting, alongside advanced techniques for the preliminary reinforcement of bench slopes. These geomechanical and technological solutions subsequently achieved widespread operational adoption across mining enterprises [3.114-115].

Between 1980 and 1990, Academician Vakhob Rakhimov chaired the Educational and Methodological Council on Mine Surveying within the Mining Educational and Methodological Association under the USSR Ministry of Higher Education. Concurrently, for seven years from 1984 to 1991, he served with distinction as the First Vice-Rector of the Tashkent Polytechnic Institute [15].

In this administrative capacity, he contributed significantly to the institutional advancement of the institute, the strategic integration of pedagogical processes with industrial production, and the rigorous practical training of prospective engineers.

In 1995, an expanded plenary session of the Scientific Council and commemorative academic events were organized to mark the 60th anniversary of the birth of Vakhob Rakhimovich Rakhimov, then Corresponding Member of the Academy of Sciences of Uzbekistan [16.16].

Throughout his scholarly career, the Academician authored and published over 300 scientific works, including more than 20 monographs. Under his direct academic supervision and mentorship, 3 Doctors of Sciences (DSc) and over 50 Candidates of Sciences (PhD) were successfully trained and defended their dissertations [17].

By Decree of the President of the Republic of Uzbekistan in 2004, Academician Vakhob Rakhimov was decorated with the Order of “Mehnat Shuhrati” (Order of Labor Glory) in recognition of his monumental contributions to the advancement of science and higher education [18]. In 2012, he was conferred the Medal of Friendship by the Socialist Republic of Vietnam in recognition of his outstanding contributions to the education and professional training of scientific and technical personnel for that nation [19.69-70].

Across every station of his academic journey – from an aspiring student to First Vice-Rector, and through every scholarly milestone from Candidate of Sciences to Full Academician – Vakhob Rakhimov consistently remained a noble, generous, and sagacious mentor to his disciples. In this regard, it is apt to recall the classical aphorism: “Wise is not the one who knows many things, but the one whose knowledge bears genuine utility”.

Conclusion

The mine surveying service plays a pivotal role and holds strategic importance in governing geotechnological processes to ensure the sustainable development of the mining industry in the Republic of Uzbekistan. Elucidating the historical contribution of Academician Vakhob Rakhimov – who played an instrumental role in shaping mine surveying as a distinct discipline – along with the enduring relevance of his academic school to sovereign Uzbekistan, constitutes a matter of profound contemporary significance. Furthermore, it is essential to systematically characterize the broader contributions of the Uzbek mining engineering school, particularly the role of preeminent scholars such as Academician Vakhob Rakhimov in advancing science, cultivating national engineering cadres, and generating foundational research outcomes.

Academician Vakhob Rakhimov cultivated a formidable constellation of students and scientific successors, prominently including Q.Sanakulov, S.Sayidkasimov, Sh.Sadinov, A.Kazakov, and A.Nizomova, among others. In particular, Doctor of Technical Sciences, Professor Sayidjabbor Sayidkasimov stands as one of Academician Rakhimov’s most direct and distinguished successors. Leading the Department of Mine Surveying at Tashkent State Technical University (TSTU) for many years, Professor Sayidkasimov translated his mentor’s pioneering paradigms regarding digital mine surveying and electronic instrumentation into educational practice, authoring foundational textbooks for the discipline.

All those who collaborated with Academician Vakhob Rakhimov invariably admired his profound erudition, creative intellect, tireless work ethic, and total dedication to science, alongside his capacity to elucidate complex problems with rigorous theoretical depth, formulate decisive solutions, and methodically steer them toward industrial implementation. Beyond his intellectual stature, his generosity of spirit, personal integrity, and unwavering support for his colleagues and pupils earned him immense moral authority, fostering a wide and enduring circle of devoted disciples, colleagues, and intellectual peers around him.

In conclusion, the scholarly and pedagogical legacy of Academician Vakhob Rakhimov constitutes a treasured cornerstone of Uzbekistan's mining sciences. The mine surveying frameworks, geomechanical models, and methodologies engineered by the Academician remain successfully integrated into the daily operations of the country's industrial giants – most notably the Almalyk and Navoi Mining and Metallurgical Combinats (AMMC and NMKC) – as well as within the pedagogical and research workflows of TSTU. The numerous Doctors and Candidates of Sciences trained under his scientific mentorship in the areas of low-waste geotechnologies, precision block extraction in decorative stone mining, and underground stability assurance today serve as leading experts throughout the sector. The scientific traditions and theoretical foundations established by Academician V.R. Rakhimov continue to serve as an indispensable scientific and practical foundation for ensuring the sustainable and safe development of the national mining industry, promoting rational subsoil stewardship, and educating future generations of elite mine surveying engineers.

REFERENCES:

1. Вахоб Рахимович Рахимов (к 80-летию со дня рождения). // Горный журнал Казахстана. № 10. 2014. – С. 51.
2. Заслуженный деятель науки и техники, академик Академии наук Республики Узбекистан Рахимов Вахоб Рахимович. // Журнал Горный вестник Узбекистана. № 4 (59). 2014. – С. 131.
3. Вахоб Рахимович Рахимов (к 75-летию со дня рождения). // Журнал Горный вестник Узбекистана. № 4 (39). 2009. – С. 114.
4. Ўзбекистон геология илмий мактаблари. // Бош мухаррир А.К. Нурходжаев. Ўзбекистон Республикаси геология ва минерал ресурслар давлат қўмитаси, Геология фанлари университети. Тошкент.: “Lesson Press”, 2022. – Б. 303-304.
5. Академик АН РУз Рахимов Вахаб Рахимович избран действительным членом Академии горных наук России. Горный вестник Узбекистана. № 3 (10) 2002. – С. 4.
6. https://rusneb.ru/catalog/000219_000011_RU_ГПНТБ_России_IBIS_0000682117/
7. Рахимов В.Р. Определение давлений на междукламерные целики, образующие периодическую последовательность. В сб. «Физико-механические свойства, давление и разрушение горных пород». Москва, Изд-во АН СССР, вып. 1, 1962.
8. Kompaniya tarixi. История: хронология создания и преобразований. <https://georang.uz/history>
9. Vahob Rahimov. https://uz.wikipedia.org/wiki/Vahob_Rahimov
10. Рахимов Вахоб Рахимович (к 90-летию со дня рождения). // О‘zbekiston konchilik xabarnomasi. № 3 (98), 2024. – С. 138.
11. Ташкентский Политехнический Институт им. Абу Райхана Беруни. // Редакционная коллегия: ректор ТашПИ, академик АН УзССР К.С. Ахмедов (председатель), академик АН УзССР Х.Ф. Фазылов, член-корреспондент АН УзССР Х.Р. Рустамов, профессора А.Б. Бабаханов, И.М. Мирходжаев (зам. председателя), К.Х. Хасанов. Г.Н. Молчанов, В.Р. Рахимов, Н.А. Никифоров, К.К. Казакбаев, М.И. Ниязов, З.С. Ибрагимов, доценты И.А. Ливерко, У.А. Исамухамедов, У.А. Икрамов, Ф.Р. Исмагуллаев. Ташкент: ФАН, 1979. – С. 106.
12. Рахимов В.Р. Исследование механических процессов в массиве горных пород при камерно-столбовой системе разработки. Автореф. докт. дисс. Москва, 1972.
13. Rahimov Vahob Rahimovich. 16.07.2022. <https://uztext.com/103732-text.html>
14. Satbayev University scientists. Rakhimov Vahob Rakhimovich 1934-2014.

<https://museum.satbayev.university/en/muzey-istorii/uchenye-satbayev-university>

15. Рахимов, Вахоб Рахимович. https://ru.ruwiki.ru/wiki/Рахимов,_Вахоб_Рахимович
16. Ҳабибулла Асатович Акбаров. Тузувчилар: А.И. Ҳамробоев, муҳаррирлар: А.Н. Султонхўжаев, Т.М. Миркомиллов. Тошкент: ЎзР ФА Фан нашриёти, 1996. – Б. 16.
17. Turkum: Mehnat shuhrati ordeni sohiblari. https://uz.wikipedia.org/wiki/Turkum:Mehnat_shuhrati_ordeni_sohiblari
18. Санакулов К., Саййидқосимов С.С., Садинов Ш.М., Казаков А.Н., Низамова А.Т. Рахимов Вахоб Рахимович (к 90-летию со дня рождения). // Горный вестник Узбекистана. № 3 (98), 2024. – С. 139.
19. Ахмедов Н.А., Ежков Ю.Б. Редкометалльная стратегия Узбекистана (потенциал, рост, перспективы освоения). O'zbekiston konchilik xabarnomasi № 2 (89) 2022. – В. 69-70.

REFERENCES (TRANSLITERATION / ENGLISH FORM):

1. Vaxob Raximovich Raximov (k 80-letiyu so dnya rojdeniya). // Gorniy jurnal Kazaxstana. № 10, 2014. – S. 51.
2. Zaslujenniy deyatel nauki i texniki, akademik Akademii nauk Respubliki Uzbekistan Raximov Vaxob Raximovich. // Gorniy vestnik Uzbekistana. № 4 (59), 2014. – S. 131.
3. Vaxob Raximovich Raximov (k 75-letiyu so dnya rojdeniya). // Gorniy vestnik Uzbekistana. № 4 (39), 2009. – S. 114.
4. O'zbekiston geologiya ilmiy maktablari. // Bosh muharrir A.K. Nurxodjayev. O'zbekiston Respublikasi Davlat geologiya va mineral resurslar qo'mitasi, Geologiya fanlari universiteti. Toshkent: "Lesson Press", 2022. – B. 303–304.
5. Akademik AN RUz Raximov Vaxab Raximovich izbran deystvitelnim chlenom Akademii gornix nauk Rossii. // Gorniy vestnik Uzbekistana. № 3 (10), 2002. – S. 4.
6. [Rossiya davlat ommaviy ilmiy-texnik kutubxonasi \(GPNTB\) elektron katalogi: NEB portali.](#)
7. Raximov V.R. Opredeleniye davleniy na mejdukamerniye tseliki, obrazuyushiye periodicheskuyu posledovatel'nost. V sb. «Fiziko-mexanicheskiye svoystva, davleniye i razrusheniye gornix porod». Moskva: Izd-vo AN SSSR, vip. 1, 1962.
8. [Kompaniya tarixi. Istoriya: xronologiya sozdaniya i preobrazovaniy. O'zgeorangmetLITI rasmiy portali.](#)
9. [Vahob Rahimov — Vikipediya ochiq ensiklopediyasi.](#)
10. Raximov Vaxob Raximovich (k 90-letiyu so dnya rojdeniya). // O'zbekiston konchilik xabarnomasi. № 3 (98), 2024. – S. 138.
11. Tashkentskiy Politehnicheskii Institut im. Abu Rayxana Beruni. // Redakcionnaya kollegiya: rektor TashPI, akademik AN UzSSR K.S. Axmedov (predsedatel), akademik AN UzSSR X.F. Fazilov, chlen-korrespondent AN UzSSR X.R. Rustamov, professorlar A.B. Babaxanov, I.M. Mirxodjayev (zam. predsedatelya), K.X. Xasanov, G.N. Molchanov, V.R. Raximov, N.A. Nikiforov, K.K. Kazakbayev, M.I. Niyazov, Z.S. Ibragimov; dotsentlar I.A. Liverko, U.A. Isamuxamedov, U.A. Ikramov, F.R. Ismatullayev. Toshkent: FAN, 1979. – S. 106.
12. Raximov V.R. Issledovaniye mexanicheskix protsessov v massive gornix porod pri kamernostolbovoy sisteme razrabotki. Avtoref. dokt. diss. Moskva, 1972.
13. [Rahimov Vahob Rahimovich — UzText elektron arxivi.](#) 16.07.2022.
14. [Satbayev University scientists. Rakhimov Vahob Rakhimovich 1934–2014. Satbayev universiteti tarixi muzeyi.](#)
15. [Raximov, Vaxob Raximovich — Ruwiki ensiklopediyasi.](#)
16. Habibulla Asatovich Akbarov. Tuzuvchilar: A.I. Hamrobayev; muharrirlar: A.N. Sul-tonxo'jayev, T.M. Mirkomilov. Toshkent: O'zR FA Fan nashriyoti, 1996. – B. 16.
17. [Turkum: Mehnat shuhrati ordeni sohiblari — Vikipediya.](#)
18. Sanaqulov Q., Sayyidqosimov S.S., Sadinov Sh.M., Kazakov A.N., Nizamova A.T. Raximov Vaxob Raximovich (k 90-letiyu so dnya rojdeniya). // Gorniy vestnik Uzbekistana. № 3 (98), 2024. – S. 139.
19. Axmedov N.A., Yejkov Yu.B. Redkometallnaya strategiya Uzbekistana (potensial, rost,

Turkic historical studies. № 3 (10) 2026 шілде – тамыз – қыркүйек
perspektivi osvoyeniya). // O‘zbekiston konchilik xabarnomasi. № 2 (89), 2022. – B. 69–70.