КОЛЬСКИЙ НАУЧНЫЙ ЦЕНТР

ACADEMICIAN OF THE RUSSIAN ACADEMY OF SCIENCES FELIX PETROVICH MITROFANOV – KNIGHT OF SCIENCE

dedicated to the 90th anniversary of birth


GEOLOGICAL MAP OF THE KOLA REGION

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SUBDIVISION OF THE FEDERAL RESEARCH CENTRE
“KOLA SCIENCE CENTRE OF THE RUSSIAN ACADEMY OF SCIENCES”

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CONTENTS

INTRODUCTION

On 22 June 2025, we marked the ninetieth anniversary of birth of Academician Felix Petrovich Mitrofanov – a Full Member of the Russian Academy of Sciences, an Honoured Geologist of the Russian Federation, and a Laureate of the State Prize of the Russian Federation in Science and Technology. For many years he served as Director of the Geological Institute of the Kola Science Centre of the Russian Academy of Sciences.

This outstanding individual and eminent scholar left an indelible imprint on the history of the Institute and on the scientific life of the entire northern region. It was this legacy that inspired the idea of preparing a book in his memory. The initiative arose simultaneously in my mind – as Director of the Institute – and in that of his wife, Tamara Borisovna Bayanova. Together, we sought to realise this idea through our combined efforts.

It is both a privilege and a profound responsibility for me to work with my colleagues on this volume, for I had the honour of knowing Felix Petrovich personally. During his directorship I headed one of the laboratories, and was entrusted with the implementation of several research projects undertaken at his initiative and under his guidance. Together we also organised training of geologists at the Murmansk State Technical University. For this reason, within these pages I act not merely as an editor, but also as a co-author, sharing, alongside my colleagues, my personal reflections on certain episodes and undertakings described herein.

This book does not claim to be a comprehensive biographical account that would encompass every aspect of Felix Petrovich Mitrofanov's life and professional activity. In the age of advanced information technologies, anyone may readily access factual material or reference data of interest. Our purpose has been different: to gather recollections of those who worked with Felix Petrovich, i. e., colleagues and friends who wished to share with the reader their memories of the most significant facets of his diverse and fruitful career, investing these pages with a part of their own spirit and their personal remembrance of him.

We wish to emphasise that what is presented here reflects our collective perception of events that took place some time ago, and our understanding of the role that Felix Petrovich Mitrofanov played in the life of the Institute and in the development of the Kola Region as a whole.

We hope that this book will be of interest to a wide readership. For those who have long worked at our Institute and in other divisions of the Kola Science Centre, it may serve as a reminder of some important events from the not-so-distant past. For the graduates of the Department of Geology and Mineral Resources of the Apatity Branch of the Murmansk State Technical University, it will bring back memories of the years when, as young school-leavers, they first embarked upon their path in geology. For those who regard Felix Petrovich as their teacher, the book may reveal

certain lesser-known details of his life. And for all readers – whatever their reasons for turning to these pages – it may offer an opportunity once again to remember this remarkable person and perhaps to perceive more fully the profound role he played in the development of geological science on the Kola Peninsula.

N. E. Kozlov, Professor, Dr. Sci. (Geol.-mineral.)
Director of GI KSC RAS

FOREWORD

In 2025, the Geological Institute of the Federal Research Centre "Kola Science Centre of the Russian Academy of Sciences" hosted another Fersman Scientific Session, which on this occasion was dedicated to the ninetieth anniversary of birth of Academician Felix Petrovich Mitrofanov.

At the initiative of the present Director of the Geological Institute, Professor Nikolay Evgenievich Kozlov, as well as of T. V. Rundkvist and myself, I was invited to deliver a plenary lecture devoted to this notable event. I accepted the invitation with great enthusiasm, as my father, Valentin Andreevich Pripachkin, maintained exceptionally close professional – and indeed friendly – relations with Felix Petrovich. Throughout nearly the entire period of Mitrofanov's directorship (1986–2008), my father served as his Deputy Director for Research.

The resulting presentation bore the title "Felix Petrovich Mitrofanov — a Distinguished Personality, a Successful Scientist, and a Gifted Organiser." In that lecture, we endeavoured to highlight, as fully as possible, the most significant stages in Mitrofanov's scientific career associated with his work at our Institute.

In discussing with Professor Kozlov the format of the present volume, we decided that it would be worthwhile to link recollections of different individuals concerning these periods with a coherent historical framework – in much the same way as it had been done in our presentation. As in that earlier work, the historical narrative has been constructed on the basis of materials drawn from two major scholarly monographs published by the Kola Science Centre Press in 2023: "The History of Kola Academic Science: The Formation of the Kola Science Centre of the Russian Academy of Sciences and Its First Scientific Institute (Geological Institute of KSC RAS)" and "The Kola PGE-bearing Province."

However, this book mainly consists of personal recollections of Felix Petrovich's family members, friends, and colleagues, reflecting their memories of his remarkable life, rich in meaningful work and discovery. These recollections vary in character: some are more intimate and emotional, others more scientific and professional in tone. Yet together they vividly reflect manifold facets of Felix Petrovich Mitrofanov's personality – that of a good man, a reliable friend, an eminent scholar, and a brilliant organiser of science.

P. V. Pripachkin*, *Cand. Sci. (Geol.-mineral.)
Senior Researcher at GI KSC RAS, Associate Professor at MAU

CHILDHOOD AND YOUTH (1935–1957)

"Felix Petrovich Mitrofanov was born on 22 June 1935 in the city of Chkalov (now Orenburg) into the family of office employees. After graduating in 1952 from Secondary School No. 13 in the city of Kuibyshev (now Samara), he entered the Faculty of Geology at Leningrad State University, from which he graduated with distinction in 1957".

Such are the brief lines of his official biography. Yet both his childhood and youth were marked by deeply dramatic events that had a decisive influence on his later life. Soon after his birth, he was deprived of his closest family members – his parents, who fell victim to the repressions of the 1930s. But let us now give the floor to Felix Petrovich's relatives.

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Recollections of Cousin Valery Leonidovich Massover

Felix Petrovich's father, Petr Vasilievich Mitrofanov, graduated in Moscow from the "Red Professorship" Institute (according to my parents' recollections).

Parents of Felix Petrovich Mitrofanov.
From left to right: Nina Vasilievna Gnedina, sister Irina, and Petr Vasilievich Mitrofanov.
Photograph taken circa 1933–1934

Petr Vasilievich served as Secretary of the Orenburg Regional Committee of the All-Union Communist Party (Bolsheviks). After the arrival in Orenburg for the plenary session of the Regional Committee of A. A. Zhdanov, Secretary of the Central Committee of the VKP(b), a real wave of repressions ensued. On his orders, the Bureau of the Orenburg Regional Committee was dissolved, and all its members, with the exception of Gorkin, were declared "hardened bandits and enemies of the people." The same fate befell the secretaries Grishaev Petr Grigorievich, Mitrofanov Petr Vasilievich, and others. Of the 65 members of the plenary, 31 were declared "enemies of the people." Archival data from the Orenburg Regional KGB indicate that the repressions of 1937–1938 affected some 12 000 residents of Orenburg.

My parents held Petr Vasilievich in great affection. They knew him well and fondly referred to him as "our Petya."

Felix Petrovich's mother, Nina Vasilievna Gnedina, graduated from an industrial institute. She was the sister of my mother, Elizaveta Vasilievna Gnedina. When Petr Vasilievich was arrested, she was also taken into custody and pressured to sign a statement declaring him an enemy of the people. Hours of interrogation, however, yielded nothing, as she steadfastly refused to comply. Consequently, she was exiled to the Mordovian labour camps, where living conditions were extremely harsh. In 1945, after eight years in the camps, she was released under an amnesty and returned to Moscow in a severely weakened physical and psychological state. Her situation was further complicated by the absence of both a passport and housing. She was issued a certificate of release, which prevented her from finding employment. At this point, my father, Leonid Ilyich Massover, came to her aid. He had been sent from Samara to Central Asia to combat the Basmachi insurgents.

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Recollections of a cousin Lilia Leonidovna Tamanova

In 1946, my father, Leonid Ilyich Massover, held the position of Chief of the Regional Police Department in the city of Termez. Since Termez was a closed border city, he arranged accommodation for Nina Vasilievna at a nearby state farm, where she remained until he managed, at considerable personal risk, to secure her a passport. She was then able to return to Moscow, where her elder sister, Nadezhda Vasilievna, was living.

Felix Petrovich often visited us, first in Termez and later in Tashkent, to which we moved in 1950. I have vivid memories of him during that time. Always energetic, cheerful, and exceptionally kind, he remained thus in my childhood recollections. He would go hunting and fishing with my father and brothers. His final visit to Central Asia was in 1957, when I had just completed school and was considering my

Vasiliy Lavrentievich Mitrofanov with his grandchildren (from left to right):
Felix, Zoriy, and Vyacheslav. Kuibyshev, 1939

Felix with his aunt Maria Vasilievna Mitrofanova and cousin Vera, 1947

future profession. I had developed an interest in amateur art and was contemplating the theatre institute.

Felix Petrovich firmly advised me: "One must have a solid professional ground; theatre can remain a hobby. I was really into amateur school performances either. I played comedic roles in Gogol's plays and did pretty well, but in the end I chose geology – and I have never regretted it". Thus my cousin influenced me, and I eventually pursued a career in medicine. I studied in Leningrad, where I met Felix on several occasions and visited him at home. Later, I married and moved to Czechoslovakia.

After completing school, Felix initially enrolled at a Military Academy in Leningrad, but upon the authorities learning that he came from a family of repressed persons, he was expelled. He then entered the Faculty of Geology, and the country gained a talented scientist.

I did not know the Mitrofanov relatives on his father's side, but I was well acquainted with the relatives on his mother's side, the Gnedins – all the uncles and aunts, as well as their children. Felix's grandmother, Praskovya Lavrentievna, came from a family of serfs, while his grandfather, Vasiliy Alexandrovich, was a Volga Cossack. He accepted Soviet rule and became the first head of the police in the town of Perelyub. A historical photograph survives in which he is pictured alongside Frunze and Furmanov. The family was large, comprising nine children, and Felix's grandmother Praskovya Lavrentievna was regarded as a heroine mother. To this day, numerous members of the Gnedin family reside in Samara.

Recollections of a cousin Vera Petrovna Sergeeva

Felix's childhood was spent in Kuibyshev (now Samara), in the household of his grandfather, Vasiliy Lavrentievich Mitrofanov. I will try to recount this period of Felix's life, but I should first note that there was an eleven-year age difference between us, and naturally our relationship was that of "a teenage brother and a little sister." He played and walked with me, looked after me when the adults were absent, and fed me, but I was not actively involved in his life. Our relationship became closer only when I grew older. Another point is that the family rarely spoke about his coming to live with them – a silence understandable given the circumstances of the time. Consequently, my account is fragmentary and based largely on the memories of my aunts.

To begin with our roots:

Grandfather Vasiliy Lavrentievich Mitrofanov, a native of the Volga village of Obsharovka, was literate and, after marriage, moved to St Petersburg for work, initially receiving assistance from his cousin Alexey. A tall, stately, dark-haired man, he married a petite, delicate girl from his village, Dunya. They lived a long and happy family life. His wife, Evdokiya Vasilievna, bore him twelve children, of whom three sons and seven daughters survived to advanced age. In St Petersburg,

Vasiliy initially worked at the Tsarskoye Selo cemetery as a labourer, but his sobriety, diligence, and evident abilities soon earned him appointment as caretaker, along with a service apartment. Their first daughter, Nadezhda, was born there in 1897, followed by six more children. The growing children were given a proper education: all attended school, the eldest son Petr studied at a technical secondary school, and the daughters took courses in millinery.

Petr Mitrofanov, born in 1898, was the pride and hope of the family, excelling in his studies and displaying determination and focus. When the First World War began, grandfather brought the family back to their native village, purchasing a house and establishing a household. Three more children were born in Obsharovka, and the family once again lived in relative prosperity. However, the process of *dekulakisation* began, and grandfather, abandoning everything, relocated to Samara. This was his "flight from the revolution," which his son Petr, a devoted Komsomol activist and organiser of the Samara Komsomol, had served so faithfully. In Samara, grandfather worked as a cab driver for a local institution. The family lived in a single-storey brick house in the city centre.

Soon, Petr moved to Moscow, worked at the Central Committee of the Komsomol, and graduated from the "Red Professorship" Institute. He was subsequently assigned to Orenburg as the First Secretary of the Regional Committee. It was there, in 1935, that Felix was born.

In 1937, Petr Vasilievich received a visit from his brother and sister in Orenburg. They witnessed his arrest, but he managed to tell them: "Take the children to Samara." On the same day, Felix and his elder sister Irina were taken away. Nina Vasilievna, Petr's wife, was arrested shortly thereafter and remained in the camps until she was released under the amnesty following Stalin's death.

Felix Mitrofanov, pioneer.
Kuibyshev, 1947/48

Our family preserved Petr Vasilievich's last letter, which he managed to pass on to my father. In it, he requested that Felix remain in our household and Irina be entrusted to his mother-in-law, who was then living in Samara. He explained what might seem a harsh decision: it was better to separate them so that one might survive if the other could not. He wrote: "Keep Felix with you; he does not even know his surname, he would be lost in an orphanage. He must grow up as a Mitrofanov."

Felix with his school friends along the Volga River, 1948/49

Thus, the two-year-old boy found himself in a large household: his grandfather lived in the house with four daughters and a son, Vladimir.

Felix spoke very late, apparently as a result of the stress caused by separation from his parents. Yet he grew up healthy, cheerful, and was the favourite of his grandfather (his grandmother Evdokiya had died in 1931). I do not know how the aunts managed the legal arrangements — whether by adoption or guardianship — but the boy created his own family in his imagination: he called his uncle "Papa Vova," my mother Maria, who was the youngest of the sisters, "Mama Musya," and another aunt "Grandma" — although she was only forty-two at the time.

After his grandfather's death at the beginning of the war, Felix lived with Anastasia Vasilievna ("Grandma") and her husband in a large house with a garden on the outskirts of Samara, where he began his first year of school. Later, following the death of her husband, Anastasia moved with Felix into his father's house.

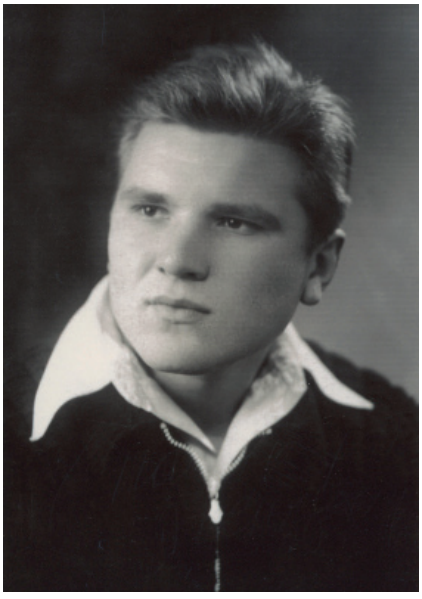
During the war, everyone worked, and the boy went to school on his own and applied himself to his studies. Everyone held a work card, and Maria was already employed at the Regional Department of Internal Affairs as an investigator. By the standards of the time, life was relatively stable. Certainly, the arrest and death of Petr Vasilievich had a profound impact on the family, above all on the grandfather – he had lost his beloved son, branded as an "enemy of the people." Some of the brothers and sisters were dismissed from their jobs, some expelled from the Party,

and, most significantly, the family's character changed – they began to live in seclusion, constantly fearing for the boy, whom everyone adored, lest he be taken away.

Felix excelled at school, growing strong, vociferous, and energetic. He spent much of his time at the Pioneer House, participating in the drama club, performing at concerts and at New Year's celebrations (for which he received gifts, of which he was very proud). He trained seriously in speed skating, braving open-air stadiums, rigorous exercise, and the cold. He read extensively and graduated from school with a medal. The family long preserved his medal, certificates, and school reports with excellent marks. It seemed to me that the aunts wished he would be less conspicuous, "quieter," in a way.

During the summers, he would disappear with friends along the Volga, yet he always helped the aunts with the potato harvest — as everyone had vegetable gardens – and with chopping firewood. I recall only one occasion when he was punished: my mother spanked him after discovering that he had been playing a knife game for money with local children. Yet Felix held authority among them, and I was never bullied in the streets: "Ah, she is a Mitrofanov girl…"

Within the family, Felix was cherished. But it was not only the adults who respected him for his seriousness and independence. A small detail: the family lived six people in a two-room apartment (I had already been born), yet as Felix grew older, he had his own room. He had many friends, but his closest friend was Yura Bogatyr, to whom he showed particular warmth. When Yura was dying of cancer in a Moscow clinic, Felix flew from Leningrad and stayed with him for several days.



Felix Mitrofanov, student of the Faculty of Geology at the Leningrad State University, 1955

After finishing school, Felix hoped to enrol in a flight school, but his documents were returned with no explanation. He then went on to enter the Leningrad University, marking the beginning of his life in geology.

There was another moment when he considered a different path. From his first year, he acted in the student theatre, and it was suggested that he pursue a theatrical education. However, this would have meant studying without a scholarship and losing one or two years – I do not remember exactly – which the family could not afford for financial reasons. Thus, Felix remained a student of the Faculty of Geology, although his love for theatre endured for many years; as a postgraduate, he even co-wrote a play with a friend.

Geology student Felix Mitrofanov on one of his field expeditions

Initially, Felix returned to Samara for the summer holidays, but then the field expeditions began. His visits home became less frequent, yet letters, phone calls, and support for the aunts who had raised him continued.

And one more thing to mention. A true drama unfolded in the relationships between the members of our family, who had raised the boy, and Nina Vasilievna, Felix's mother. She had been released from the camps and initially lived in Central Asia and the Rostov Region before returning to Moscow. These relationships were marked by pity for a woman who had endured so much, gratitude on her part, mutual jealousy, and a struggle for Felix's affection. I believe that it was he who suffered the most, and I can scarcely imagine how a young man managed to cope with such a "split in two."

Over time, however, matters gradually settled. Nina Vasilievna visited us in Samara on several occasions, and we travelled to Moscow to see her. She was an extraordinarily intelligent and strong-willed woman.

According to the plans of my mother and aunts, after finishing school I was supposed to go to Leningrad to study under Felix's supervision. However, I happened to meet a journalism student from Kazan University… and I went to Kazan. After my first year, I married. My meetings with Felix became infrequent, yet each of his visits to Samara and my trips to St Petersburg were a joy. He was always present in my life, regarded as a reliable friend and protector. I am sure that Felix remembered his years in Samara, both childhood and adolescence, with warmth and gratitude.

Thus unfolded a particularly difficult period in Felix Petrovich's life: the loss of his father and, for a long time, his mother; life in the large household of close relatives; the challenges associated with the stigma of being "the son of an enemy of the people." Felix Mitrofanov could have become a pilot or an actor, but fate guided him to his true vocation – geology.

So, he entered the Faculty of Geology at the Leningrad University. New friends, stimulating lectures, geological fieldwork, and the first expeditions marked the beginning of this stage. Finally came the graduation evening, the awarding of his diploma, and the commencement of his adult life. His first professional position was at the Leningrad Institute of the Precambrian Geology and Geochronology of the USSR Academy of Sciences (IGGD), formerly the Laboratory of the Precambrian Geology of the USSR Academy of Sciences (LAGED).

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Student, 1956

WORK AT THE INSTITUTE OF THE PRECAMBRIAN GEOLOGY AND GEOCHRONOLOGY OF THE USSR ACADEMY OF SCIENCES (IGGD USSR AS) (1957–1985)

Felix Petrovich was employed at this institute from 1957 to 1985. He progressed from senior laboratory assistant to Deputy Director for Science, from a young specialist to Doctor of Sciences. Here he studied under such distinguished experts in the Precambrian geology and geochronology as Academician A. A. Polkanov; Corresponding Members of the USSR Academy of Sciences – V. A. Nikolaev, S. V. Obruchev, N. A. Eliseev, K. O. Kratz; and Professors K. A. Shurkin, A. N. Neelov, and I. K. Kozakov. Felix Petrovich regarded K. O. Kratz, K. A. Shurkin, and Professor G. M. Saranchina of the Leningrad University as his principal mentors.

Felix Petrovich always considered himself a student of the Leningrad school of Russian Precambrian geologists. Recounting international collaborations of that era in the field of Precambrian geology, he spoke warmly of Czech Academician V. Zoubek, French Professor J. Schubert, and German geochronologist Professor A. Kröner.

In 1957–1985, Felix Petrovich conducted annual fieldwork in the mountains of the Eastern Sayan, Tuva, Mongolia, on islands and along the coast of the White Sea, in Ukraine, and across Europe, in regions underlain by metamorphic complexes forming the ancient Precambrian basement, Riphean, Palaeozoic, and Alpine structures of Eurasia. During these years, he worked for several years in Mongolia and France; he visited and studied geological sites in twenty-nine countries worldwide.

Felix Petrovich's Candidate of Sciences dissertation, defended at the Leningrad University in 1963, was devoted to the geology of the Proterozoic and Lower Palaeozoic granitoids in the southeastern part of the Eastern Sayan.

In his Doctor of Sciences dissertation, defended in 1975 at the Institute of Geology and Geophysics of the Siberian Branch of the USSR Academy of Sciences, as well as in a series of related works, he identified and described principal types of the early Precambrian migmatite and granitoid formations and demonstrated their metallogenic features (Rundkvist et al., 2023).

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Recollections of Head of the Laboratory of Geology and Geodynamics, IGGD RAS, Doctor of Geological and Mineralogical Sciences, Professor Alexander Borisovich Vrevsky

Several outstanding individuals had a great impact on my scientific worldview, my attitude towards science in general, and my understanding of nuances of relationships within research teams. Among them were Professor

G. M. Saranchina of the Department of Petrography at the Leningrad State University, Corresponding Member of the Academy of Sciences K. O. Kratz, and, at the time, Doctor of Geological and Mineralogical Sciences Felix P. Mitrofanov.

In 1974, when I graduated from the Department of Petrography, I found myself with no job as the conscription of reserve officers from universities had been cancelled. So I sought G. M. Saranchina's advice regarding employment. She immediately reached out to F. P. Mitrofanov at IGGD RAS, asking him to recommend me to K. O. Kratz. From that moment – now more than fifty years ago – my professional path became closely intertwined with IGGD RAS, and Felix Petrovich Mitrofanov came to play a truly formative role in it.

The 1970s were an exceptionally favourable period for IGGD and for academic geological science as a whole. Fieldwork of two to three months or longer was possible, using helicopters, expedition transport, and, in Siberia, pack horses and reindeer. The Institute – and Felix Petrovich in particular, as Secretary of the Scientific Council of the Academy of Sciences on Precambrian Geology and the International Geological Correlation Programme (IGCP) – took an active part in international geological cooperation under various IGCP projects.

During these years, the Institute was alive not only with science but also with social and Party life, in which Felix Petrovich enthusiastically participated as the leader of numerous initiatives. He persuaded me to join the Party, drawing on his own life experience (his parents, like my father, had been repressed) and the opinion of K. O. Kratz, who believed that the Institute should "have as many decent people as possible" in this organisation, which at the time exerted great influence over all areas of activity (*quote*). Later, when he became Acting Director, Felix Petrovich encouraged me to take up the position of Scientific Secretary, and later supported my candidacy for the position of Director of IGGD.

As a natural leader, Felix Petrovich was an ambitious man, a trait evident not only in his scientific and organisational activities. A memorable event in the life of the Institute was the sporting competitions he organised, called "Dokembriada-74." One of the contests involved lifting a 20 kg barbell. The competitive spirit was intense, and when Felix Petrovich won with a score of 10 to 9.5, he rejoiced like a child.

In 1983, the Director of IGGD RAS, K. O. Kratz – Felix Petrovich's ally and friend – passed away, marking a turning point both in his life and in that of the Institute as a whole. Everyone, including Felix Petrovich himself, expected that he would be appointed the new Director, having served as Acting Director for nearly a year.

During this brief period, Felix Petrovich devoted himself with remarkable energy to the Institute's scientific and administrative activities. He organised a comprehensive expedition to study the geology of the Baikal-Amur Mainline (BAM) Region, conducted a series of international geological excursions and meetings on the Baltic Shield, restructured isotope-geochronological research using

Participant of Dokemriada-74 A. B. Vrevsky (left);
participant and organizer of Dokemriada-74 F. P. Mitrofanov (right)

F. P. Mitrofanov – winner of the barbell-pressing competitions!

new domestic mass spectrometers, and much more. I am particularly grateful to Felix Petrovich for accommodating me at that time, agreeing not to include me in the BAM expedition, thereby allowing me to continue working on the Kola Peninsula.

However, within the higher echelons of the Academy, it was decided to appoint D. V. Rundkvist as Director of IGGD RAS, a decision that provoked strong protests within the Institute. Felix Petrovich was appointed Deputy Director for Research. This arrangement satisfied neither the new Director nor his Deputy. As Felix Petrovich remarked, "Two bears cannot live in the same den." During this difficult period, he received support from the President of the Kola Branch of the USSR Academy of Sciences, Corresponding Member G. I. Gorbunov, who in 1986 proposed that he assume the position of Director of the Geological Institute. In retrospect, this challenging decision – relocating to the Arctic, joining a new and unfamiliar team – became a historic event for both institutes.

D. V. Rundkvist significantly strengthened metallogenic research at IGGD RAS, dismantled its "patriarchal familial culture," and leveraged his ministerial contacts to modernise the instrumentation and analytical base for isotope studies. Felix Petrovich, in turn, gave a vigorous scientific and organisational impetus to the Geological Institute of the Kola Branch of the USSR Academy of Sciences / Kola Science Centre RAS, transforming it into a modern geological research centre. Within a few years, the Institute gained well-deserved international recognition and became a leader in several international research programmes on the Fennoscandian Shield.

Forty years have passed since then. The passions of that time have long subsided, yet both Felix Petrovich and Dmitry Vasilievich have achieved remarkable scientific successes, each eventually becoming an Academician of the USSR Academy of Sciences / RAS. Today, their photographs hang side by side in the Council Hall of IGGD, serving as a lasting tribute to these outstanding individuals and to the pivotal events in the history of the two institutes.

Three Directors of IGGD of the USSR Academy of Sciences / RAS:
from left to right: F. P. Mitrofanov, D. V. Rundkvist, V. A. Glebovitsky

Recollections of Mikhail Mikhailovich Yefimov, Junior Researcher at the Magmatism Laboratory of the Kola Branch of the USSR Academy of Sciences (1969–1997)

1964. Meeting of the Petrography Department at the Leningrad State Geological University (LSGU). After the spring examination session and before the final field assignment for my diploma research, our professors uphelp an old departmental tradition of hosting a tea party for soon-to-be graduates, where they gave their final guidance before the diploma field season.

Our dear and highly respected teachers — Galina Mikhailovna Saranchina, Nikolay Filippovich Shinkarev, Varvara Vladimirovna Lygina, Raisa Nikolaevna Kochurova, Alexander Alexandrovich Priyatkin, and, naturally, our department head Nikolay Alexandrovich Eliseev —were interested in who was going where for fieldwork and in whose company. Many of us had already decided on regions and supervisors, while some, like me, had not yet been assigned and listened attentively to the advice of our experienced teachers. G. M. Saranchina was my course work supervisor and, learning that I had not yet chosen a topic for my diploma field practice, recommended that I contact LAGED of the USSR Academy of Sciences (Institute of Precambrian Geology and Geochronology of the Russian Academy of Sciences) and consult with a young Candidate of Geological Sciences and Junior Researcher, Felix Petrovich Mitrofanov, from the Magmatism Laboratory (headed by K. A. Shchurkin): "This person is knowledgeable and highly professional, so take my advice and accompany him into the field. He will teach you a lot... and I think you will work well together." Galina Mikhailovna Saranchina turned out to be a seer...

At LAGED, I was greeted by Vladislav Pavlovich Markach (the head of the field team), who processed all the necessary papers and sent me by train to the east, to the Slyudyanka station of the East Siberian Railway. From there, I travelled past Lake Baikal along the Slyudyanka–Mondy road, before taking a flight to the Buryat settlement of Orlik, which lies on the left bank of the mountain river Oka. Here, I was met by V. P. Markach, and we headed together to the mountain village Ulan Malchin to get horses for our expedition. A few days later, our field expedition leader, Felix Petrovich Mitrofanov, arrived. He was a sturdy, broad-shouldered, and wide-faced man with a broad smile and remarkably energetic and quick-witted nature. Hardly had he set foot on Buryat land when locals of all ages began to gather around him. The children were handed a handful of sweets... the elders were ceremoniously presented with small cups of fiery liquor to warm themselves. Finally, the welcoming ceremony ended, and Vladislav Pavlovich introduced me: "So, you are a former sailor, I've heard about you. Well, now we're changing your profession from sailor to horseman."

Thus began my acquaintance with Felix: cautious and somewhat tense at first, more cordial as the weeks passed, and ultimately warm and collegial by the end

of the season. The season was quite challenging: long horseback routes through the remote taiga, exhausting ascents to the "dovy" — passes where, mainly, the crystalline complexes that interested the Chief (the field nickname for Mitrofanov F. P.; his friends in Moscow called him Felyusha, and in Saint Petersburg — Fely) were exposed. In the evenings, by the campfire, Felix constantly wrote detailed thoughts on his notepad about the day's work at the outcrops. We had a two-person tent, so before sleep and on quite frequent rainy days without routes, we would smoke our damp "Pamir" cigarettes and chat about everything... about who we wanted to be and who we didn't become... whom and what we loved... and what we totally didn't accept. Felix confided that he wanted to become a pilot, but ended up a geologist. He had a deep affection for the theatre and, as a student, performed in the university theatre alongside S. Yurskiy, even auditioned at the Alexandrinsky Theatre with Yu. Gorbachev, and was at the BDT (Baltic State Drama Theatre) with G. Tovstonogov himself. Once, he opened up and told me he had written a play about doctors and read it to Goga (G. T). Tovstonogov read it, praised it, but refused to produce it and advised him to hide it in a drawer. Thus was the end both of his dream and his devotion to the stage.

And I... a disappointed would-be oceanologist... a failed marine geologist... and now... a temporary labourer, taming and unleashing stubborn horses. "Don not worry, my friend, everyone passes through such moments. Remember: strive, search, persevere, and do not yield…" It wasn't me who said that, but Sanya Grigoryev from *Two Captains*... and though it sounds lofty, it's true... And now – onwards to Burun Holba! Great tasks await us!

And we reached this massif, studied the entire area, mapped it, collected many samples, and decided that this would be the basis for my diploma thesis.

We parted ways at the end of August. Felix flew to Leningrad, and we, along with our labourer Valera – a Buryat boy who dreamed of joining the Red Army someday and leading horses for several days to the horse breeders of Ulan Malchin – continued our journey. The fieldwork ended, and I returned to Leningrad with Dembren Ordanovich Munkonov, a highly respected resident of Buryatia, the discoverer of the large jade deposit (Munkonov deposit), and a constant companion of S. V. Obruchev. Sergey Vladimirovich Obruchev was at that time the director of LAGED; he had ceased on going on expeditions and was eager to meet and converse with his long-standing and faithful friend. Yuriy Valentinovich Miller and I brought Dembren along and took him around Leningrad during the day at Obruchev's request. In the evening, they, two elderly men – one a corresponding member of the USSR Academy of Sciences, the other a simple Buryat hunter – had long, heartfelt conversations and couldn't stop talking. Vladislav Pavlovich Markach, who had recently returned from Zabaykalsk, took Dembren back home to Orlik.

Meanwhile, after the fieldwork, I went to Crimea to visit my father, where I received a telegram from Felix. He said he would fly in on 10 September, asking me what I made of that. I was working in the Sayan Mountains and invited him to enjoy the deserted autumn Crimea, but he kept silent and responded only in September. In Crimea, we had a wonderful time: we travelled and explored the entire southern coast from Foros to Feodosiya, visited the Vorontsov Palace in Alupka, the lively Yalta, sunbathed on the wild beaches of Gursuf, enjoyed *chebureki* in Alushta, visited the Maximilian Kirienko-Voloshin House Museum in Koktebel, and visited the reconstructed I. K. Aivazovsky Museum in Feodosiya. Our vacation went by quickly, and we returned to the gloomy autumn St Petersburg, where normal student days and worries began – what to see, where to go, with whom, what to eat, and when to attend lectures. In between, I dropped by LAGED to deal with the rock material for the report at the department about the collected samples for my diploma and to be assigned a curator among our teachers for writing the thesis. At LAGED, I met Felix Petrovich, and together we collected samples and even drafted a preliminary outline of my diploma thesis. Knowing the perennial shortage of funds familiar to students, he suggested I do some part-time work in the evenings at the institute. I needed to crush and grind several dozen samples into powder. "Consult with V. P. Marchak about how to do it faster and more effectively, and with which instruments; he's also a pro in this matter."

F. P. Mitrofanov. Mongolia, Daribi Range, 1985

Later, he asked me to describe some thin sections for someone, to measure the contact boundaries of minerals within these thin sections, and he also gave me his diploma thesis to read. It was about the layered massif of Voryony Island, located in the Kandalaksha Archipelago of the White Sea. He spoke of his work on the White Sea with such evident affection that he could have continued indefinitely. At the time, I didn't realize how much his stories about the White Sea would influence my fate. Several years later, as a postgraduate student at LAGED, and later as a research associate at the GI KB USSR Academy of Sciences, I too, with Felix's involvement, worked for over 30 years on projects related to the White Sea. I was amazed by the diversity of Precambrian processes observed in the beautifully exposed shores of the islands and fjords of the White Sea. Felix constantly visited my team, even though he worked somewhere in Zabaikalye and later in Mongolia.

Time went by, but Felix and I always met at the White Sea and constantly recalled our worldly life, making plans for the future. I am confident that it was precisely here, in the White Sea region, that Felix conceived the idea of conducting a series of international expeditions in these lands. Thus, we completed the White Sea phase of the 1.1 IGSP CMEA project with his participation, involving geologists from socialist countries: academician V. Zoubek (Czechoslovakia), Dimitr and Zheni Kozhukharov (Bulgaria), Neumann and Reit (Germany), I. Voitsekhovskaya (Poland), and our colleagues – geologists specializing in Precambrian studies: S. B. Lobach-Zhuchenko, S. V. Bogdanova, and E. V. Bibikova from Moscow; N. M. Shcherbak from Kyiv; V. V. Puura from Tallinn; G. V. Motuz from Vilnius, and others.

This White Sea campaign inaugurated a sequence of subsequent research initiatives focused on studying Precambrian complexes, led by Felix Petrovich Mitrofanov, who at the time served as Director of GI KB USSR Academy of Sciences. He prepared a special geoodynamic test site called Voche-Lambina, where the most complicated transformations of Precambrian complexes were demonstrated within the process of the multi-stage evolution of the White Sea-Lapland Mobile Belt. Felix paid great attention to studying magmatism within this unique early Precambrian mobile zone. His motto, "Number and Measure", applied to magmatites of the White Sea Mobile Zone, revealed the multi-stage nature of anorthositic magmatism, in particular, which was confirmed by geochronological ages from both domestic geochronologists and Canadian experts. Organizing and conducting geological work within the framework of the international geological project "Anorthosites of the World..." became a recognition of the Russian school of magmatism, geodynamics, and geochronology. This attracted various higher educational institutions in Russia and abroad for student training at the White Sea sites on the international Voche-Lambina test site, including students from MSU (Perchuk L. L.), LSU (Gordienko V.), Vilnius University (Motuza G.), Tallinn University (Puura V. A.),

Oulu University (T. Alapietti), and Wrocław University (Voitsekhovskaya I.). Naturally, Felix Petrovich was the driving force behind this educational initiative and the establishment of the department at GI KSC, where he and his colleagues delivered lectures on various aspects of the Precambrian geology and geochronology.

The last time I met Felix was in St Petersburg in 2013. We reminisced about everything — our first fieldwork, our conversations under the rain drip from the roof of our tent, the amazing taste of wet "Pamir" cigarettes, the trip to Crimea, the beauty of the Carpathians in Romania, the incredible "Alyosha" monument in Plovdiv, and the colossal head of Karl Marx in Karl-Marx-Stadt (Germany). We also remembered and paid tribute to many of our friends and remarkable people – Vladimir Zoubek, Vasil Vergilov, Dimitr and Zheni Kozhukharov, Vaino Puura, Geda Mota, Rostislav Gorbachev (Sweden), Tom Alapietti (Finland), and our teacher and lifelong mentor, Kauko Ottovitch Kratz (Canada, Leningrad).

We sat together for a long while, reminiscing, reluctant to part. "Well, tell me, did we live a good life? Didn't I transform you from a sailor into a geologist?" "Almost," was my reply. "See you later."

We embraced and patted each other on the shoulders for a long, long time, ruffling what little remaining gray hair we had. Until we meet again—that's what his closest friends called him... Vladik Marchak, Dimitr and Zheni Kozhukharov, Vanya Kazakov, Tamara Bayanova, and I, the one who wrote these lines.

M. M. Yefimov and F. P. Mitrofanov (left to right), 2013

WORK AT THE GEOLOGICAL INSTITUTE OF THE KOLA SCIENCE CENTRE, RUSSIAN ACADEMY OF SCIENCES (1986–2014)

In January 1986, F. P. Mitrofanov was appointed Director of the Geological Institute of the Kola Science Centre of the USSR Academy of Sciences (GI KSC RAS). Thus began his work in the city of Apatity on the Kola Peninsula, a region to which he remained devoted until the end of his life. Felix Petrovich served as Director of GI KSC RAS until 2008, and then he continued his work at the Institute as Chief Researcher and Consultant — Academic Adviser. During this period, F. P. Mitrofanov was first elected Corresponding Member of the Russian Academy of Sciences in 1990, and later Academician in 2000. In addition, he was awarded the title of Professor in 1996 and honoured as a Distinguished Geologist of the Russian Federation in 2011.

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Recollections of Director of the Geological Institute, Doctor of Geological and Mineralogical Sciences (2018-present day), Professor Nikolay Evgenievich Kozlov

At the time when, as A. B. Vrevsky described, "passions" were running high at IGGD, I. V. Belkov submitted his resignation from the post of Director of the Geological Institute of the Kola Branch of the USSR Academy of Sciences (GI KB USSR AS). The Chairman of the Presidium of the Kola Branch, Corresponding Member G. I. Gorbunov, summoned me – at that time Secretary of the Party Committee – to discuss who should be appointed to the position, as was the customary practice. None of the candidates available within our Institute were, for various reasons, seemed unsuitable for the post of Director, in either his view or mine.

During those days, my close colleague and university classmate A. B. Vrevsky called me to describe the situation at their Institute (IGGD RAS). As I recall – though many years have passed – Felix Petrovich spoke of this very call. By that time, I knew him fairly well; he had visited our Institute for various meetings, maintained friendships with our colleagues M. M. Yefimov and M. N. Bogdanova, with whom I was also on very good terms. The account of Felix Petrovich made a strong impression on me, and, supplementing it with my own knowledge, I proposed his candidacy to Grigory Ivanovich. He considered it for some time and ultimately made, as further events proved, an extremely sound decision.

In 1986, the Geological Institute of the Kola Branch of the USSR Academy of Sciences, now under the leadership of Dr. Felix P. Mitrofanov – who had arrived from the Leningrad Institute of the Precambrian Geology and Geochronology (IGGD RAS) – entered a period of strategic reorientation and social upheaval, in line with the country's "*perestroika*." These changes subsequently led to a sharp reduction in staff. Due to the cessation of funding for numerous programmes, applied research conducted at industrial sites was halted.

Four departments were established to restructure the Institute's work, optimise staff allocation across priority research directions on the mineral resource base of the Kola Peninsula, and implement the Presidium of the Kola Branch's resolution "On the Structure of the Geological Institute". In particular, the Department of Structure and Geodynamics of the Kola Region (No. 1) was created under the leadership of Dr. Felix P. Mitrofanov, focusing research on the development of a deep geological model of the Kola lithosphere and its evolution, based on an integrated suite of geological, geophysical, and geochemical methods. The Department comprised the following laboratories:

- Stratigraphy and Tectonics (No. 24)
- Geochronology and Isotopic Geochemistry (No. 29)
- Regional Geophysics (No. 28)
- Geoelectrics (No. 37) — established in 1986 and headed by Candidate of Geological and Mineralogical Sciences A. A. Zhamaletdinov
- Seismology (No. 31)

Within the Department, an additional structural unit was created – the Geodynamics Group (No. 38) led by F. P. Mitrofanov (later transformed into a laboratory – *Ed. note*). The group aimed at identifying endogenous and exogenous forces acting on the lithosphere, their causes, and effects during the formation of the modern northeastern part of the Fennoscandian Shield, as well as developing new foundations for geological mapping and forecasting (Makarova et al., 2023).

Felix Petrovich soon manifested his unique professional approach, in which declarative and organisational decisions were immediately followed by tangible and prominent measures that engaged the majority of the Institute's staff.

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Organization of Research at the International Archaean Voche-Lambina Geodynamic Test Site

One of the earliest initiatives of Felix Petrovich Mitrofanov as Head of the Geodynamics Group was the establishment of field research at the Voche-Lambina site, situated some 32 km from the city of Apatity, adjacent to the St Petersburg-Murmansk highway. From 1986 onwards, the site became the focus of extensive field operations, encompassing topographic and geodetic surveys, geophysical

investigations, trenching and clearing, meticulous geological mapping, and systematic sampling. These efforts were coordinated by V. B. Alekseev, a dedicated research fellow of the Geodynamics Group, with active participation from staff across numerous divisions of the Geological Institute. The result was the creation of the Archaean Voche-Lambina Geodynamic Test Site – a truly unique locus for geological research on the Kola Peninsula.

Geologically, the site lies within the Voche-Lambina plastic-flow shear zone, part of the broader system of shear zones delineating the Belomorian and Central Kola terranes. The emplacement of gabbro-norites and gabbro-anorthosites along the Main Fault Zone marks the foundation of this dynamic structure. Within the site, the rocks of the eponymous Neoarchaean greenstone belt are exposed alongside Mesoarchaean tonalite-trondhjemite-granodiorite gneisses of the basement. The site's proximity to Apatity and the federal highway rendered it readily accessible, facilitating both research and geological excursions, as well as student field training.

Over the years, investigations at Voche-Lambina have yielded numerous significant discoveries in Archaean geodynamics, in particular illuminating the geological evolution of the tonalite-trondhjemite-granodiorite assemblages of the Archaean basement. These studies have clarified the sequence of endogenous processes that shaped the region, providing insights that continue to inform our understanding of early crustal development (Makarova et al., 2023).

Voche-Lambina Test Site, 1986.
From left to right: F. P. Mitrofanov, V. V. Balagansky (in the cabin),
I. I. Katerinchuk, M. N. Bogdanova,V. F. Smolkin

F. P. Mitrofanov with his creation –
the Geological Map of the Kola Region at a scale of 1:500 000

Geological Map Compilation

With F. P. Mitrofanov's appointment as Director of the Geological Institute of the Kola Science Centre RAS, the Institute saw a revival of geological mapping in the region. The principal outcomes of these efforts included the creation of an extensive series of maps, among which were the 1:500 000-scale Precambrian Tectonic Map (1992), the 1:500 000-scale Geological Map (1996), and a 1:1 000 000-scale model of Early Precambrian geodynamic elements of the Kola Region, fully compatible and well-correlated with contemporary maps of neighbouring European countries in the Barents Region. In 1996, F. P. Mitrofanov was awarded the A. D. Arkhangelsky Prize as Chief Editor of the "Geological Map of the Kola Region at 1:500 000 scale" (Rundkvist et al., 2023).

Geochronological Studies

Another defining feature of F. P. Mitrofanov's early tenure as Director of the Geological Institute of the Kola Branch of the USSR Academy of Sciences (from 1988, the Geological Institute of the Kola Science Centre RAS) was the

marked strengthening and intensification of geochronological research. Under his guidance, the spectrum of datable geological materials broadened considerably, and the chronological framework of key geological events across the Northeastern Fennoscandian Shield was elucidated with unprecedented clarity (Rundkvist et al., 2023). These long-term, successful geochronological investigations, which became a distinctive hallmark and the Institute's "trademark" under Mitrofanov, culminated in the establishment in 2001 of the Kola Centre for Collective Use of Geochronological and Isotope-Geochemical Research at the Geological Institute, which continues to operate successfully to this day.

Recollections of Head of the Laboratory of Geochronology and Isotopic Geochemistry (1999–2024), Doctor of Geological and Mineralogical Sciences Tamara Borisovna Bayanova

Upon his arrival from Leningrad in 1986 to lead the Geological Institute of the Kola Science Centre, Felix Petrovich Mitrofanov immediately focused on acquiring mass spectrometric equipment from Sumy, Ukraine, to advance research on the formation of the continental crust.

At that time, the Commission on Geochronology of the USSR, chaired by Academician N. P. Shcherbak (Kyiv), E. V. Bibikova (Moscow, GEOKHI), and F. P. Mitrofanov, turned its attention to the grand task of exploring the most ancient rocks of the Baltic (now Fennoscandian) Shield. Each of them focused on a specific region: Shcherbak studied the Ukrainian Shield, Bibikova dated rocks from the Taygonos and Olomon uplifts and the basement of the East European Platform using the U-Pb method, while Mitrofanov surveyed ancient complexes of the northwestern part of the Shield.

Henrikh Iosifovich Ryunhenen

The collective outcome of these extensive studies was brought together in the monograph "The Oldest Rocks of the USSR" (1984), authored and partly edited by Felix Petrovich Mitrofanov. Published shortly after the defense of his doctoral dissertation, the volume became a milestone in the Soviet Precambrian geochronology, marking a new stage in the systematic investigation of the Earth's earliest crustal formations.

When Felix Petrovich moved to Apatity, he was joined by his long-time colleague and field companion, Vladislav Pavlovich Marchak, who had headed the Separation Laboratory at IGGD. Marchak had taken part in all of Mitrofanov's major

Vladislav Pavlovich Marchak. Eastern Sayan, 1965

Expedition to the Eastern Sayan Mountains, 1965.
From left to right: V. P. Marchak, F. P. Mitrofanov, and other members of the expedition

field expeditions – to the Eastern Sayan Mountains, Mongolia, and other regions – and remained his close friend throughout his life.

One of Felix Petrovich's early priorities was to establish zircon separation for U-Pb dating. At that time, the Geological Institute already possessed an impressive analytical base, operating two solid-source mass spectrometers (MI-1201T, run by G. I. Rüngenen and O. A. Koshcheev) and two gas-source instruments (MI-1201G) for Rb–Sr and U–Pb analyses, overseen by M. P. Kravchenko, Yu. A. Kvashnin, and V. L. Semenov, along with an additional gas-source system maintained by I. L. Kamensky and V. G. Kislitsyn.

Given that the Kovdor deposit on the Kola Peninsula hosts the world's second largest occurrence of baddeleyite – after Palabora in South Africa – Felix Petrovich set an entirely new and ambitious goal to establish baddeleyite separation for high-precision U-Pb geochronology within the laboratory led by V. P. Marchak. Remarkably, Marchak fulfilled this task brilliantly, and by the late 1980s and early 1990s the first U-Pb ages obtained from baddeleyite were reported (Bayanova, 1991; Bayanova et al., 1991; Bayanova & Yakovenchuk, 1992; Bayanova et al., 1995, 1996, 1997; Bayanova, 1996; Bayanova & Mitrofanov, 1996).

Furthermore, Felix Petrovich invited one of the most prominent figures in the field – the founder of modern U-Pb geochronology, Professor Emeritus Thomas Krogh from the University of Toronto (Canada) – to join the research effort on dating zircons from the Kola Superdeep Borehole (SD-3), which at the time was being drilled under the supervision of David Mironovich Guberman. Professor Krogh's participation brought a new dimension to the project. With his vast experience in U-Pb dating of baddeleyite, he generously shared both his expertise and his practical insight, offering invaluable guidance on the identification and extraction of this rare mineral from a variety of mafic rock types..

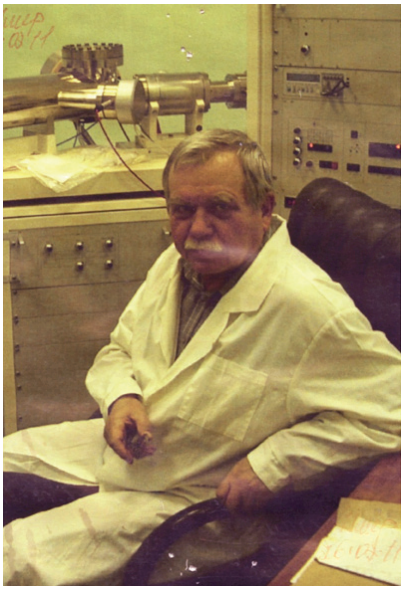
In 1998, Felix Petrovich applied to the Presidium of the Russian Academy of Sciences in Moscow for acquisition of new analytical equipment. Next year, a new 7-channel multicollector Finnigan MAT-262 mass spectrometer manufactured in Germany was installed at the Geological Institute. The instrument, equipped with a quadrupole RPQ system, made it possible to perform precise U-Pb dating of individual mineral grains or fragments, such as zircon, baddeleyite, and monazite.

Notably, this instrument remains the only mass spectrometer in Russia manufactured by the Finnigan MAT factory in Bremen, Germany, specifically for the study of the Earth's earliest crustal rocks – those formed during the planet's primordial stages.

After Thomas Krogh's visit from Canada, another world-renowned scientist, Gerald Wasserburg, granted a tracer of the artificial radioisotope ^{205}Pb to our Institute to study the Earth's oldest zircons. This extraordinary gesture reflected the international recognition of Felix Petrovich Mitrofanov as a leading figure in

Precambrian geochronology – Head of the IGCP Projects Nos. 2 and 275, as well as a pioneer in U-Pb dating of baddeleyite in Russia.

Following the acquisition and installation of the state-of-the-art Finnigan MAT mass spectrometer, Felix Petrovich established the Kola Centre for Geochronological Research (Centre for Collective Use), built upon the Institute's existing technical base. It included two solid-source mass spectrometers (MI-1201T) for U-Pb and Rb-Sr analyses, and two gas-source instruments (MI-1201G) for K-Ar and He^3/He^4 studies.



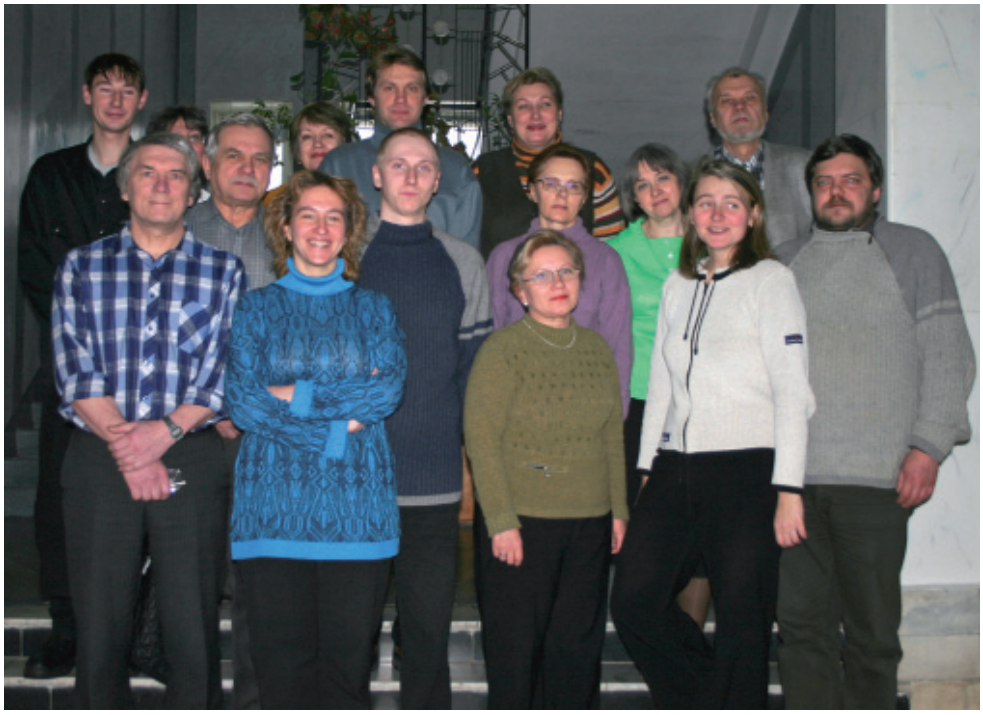
Vladimir Alexandrovich Zhavkov

To ensure the steady operation of the new German instrument, he invited Vladimir Alexandrovich Zhavkov, Candidate of Technical Sciences from the Polar Geophysical Institute, to join the team.

Felix Petrovich held Vladimir Alexandrovich's work in exceptionally high regard, often remarking, "There are many PhDs, but good engineers are few."

David Mironovich Guberman and Felix Petrovich Mitrofanov. Zheleznovodsk, 2003

Kandalaksha–Kolvitsa Tundra, 1990. From left to right:
F. P. Mitrofanov, T. Krogh, T. B. Bayanova, E. V. Bibikova, and Yu. A. Amelin



Laboratory of Geochronology and Isotope Geochemistry (2005).
Second from the right in the top row – Head of the Laboratory,
Doctor of Geological and Mineralogical Sciences T. B. Bayanova.

He paid him a salary higher than that of a laboratory head – a rare gesture that spoke to his deep respect for technical expertise. Mitrofanov consistently supported the entire engineering and technical staff – from sample preparation and chemical-analytical laboratories to the thin-section and separation facilities – by introducing additional bonuses and performance-based rewards, often funded through research contracts, RFBR grants, and international projects. He personally reviewed the Institute's staffing schedule every day, striving to maintain a fair balance between researchers and engineers so that everyone received a decent wage.

Based on an extensive body of isotopic data, a new Geological Map of Mineral Resources of the Murmansk Region (1997) was compiled. The results were later summarized in a major collective monograph published for the Institute's 50th anniversary (Geology and Mineral Resources…, 2002).

One of the principal research focuses of the Laboratory of Geochronology was the dating of magmatic complexes within the Palaeoproterozoic ore-magmatic system of the Fennoscandian Shield. These and related studies provided the basis for another remarkable chapter in the scientific life of Academician Mitrofanov, i.e., the discovery of the East Scandinavian Large Igneous Province (EScLIP) and the associated Kola PGE-bearing Province. The success of these discoveries owes much to his scientific foresight, as well as to the field and laboratory efforts of his colleagues and students at the Geological Institute of the Kola Science Centre RAS.

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Recollections of Director General of Pana JSC, Candidate of Geological and Mineralogical Sciences Alexey Urvanovich Korchagin

In January 1986, Felix Petrovich Mitrofanov assumed the position of Director of the Geological Institute of the Kola Science Centre of the USSR Academy of Sciences (now GI KSC RAS). The late 1980s and early 1990s – the time of staff reductions and financial instability – made it imperative to basically restructure the work of this regional academic geological institution and to establish a closer link between fundamental and applied research. Under Mitrofanov's leadership, the Institute entered a new stage of development, advancing several key research directions – the creation of geological maps of the region, geochronological studies, comprehensive research on the diamond potential of the Kola Peninsula, and applied investigations of diverse geological objects, including high-quality decorative stones and the hydrocarbon potential of the Barents Sea shelf (Mitrofanov & Predovsky, 2004).

Yet perhaps the most remarkable chapter in Academician Mitrofanov's scientific career was the discovery of the East Scandinavian Large Igneous Province and the associated Kola PGE-bearing Province. Closely tied to this milestone is the distinguished history of exploration and evaluation of industrial PGE (platinum-

group element) deposits within the Fedorovo-Pansky Massif on the Kola Peninsula. This achievement owed much to Mitrofanov's scientific foresight, as well as the pioneering analytical work carried out in the Institute's laboratories to develop new methods for determining platinum-group elements and gold (Pt, Pd, Rh, Au).

The study of the Palaeoproterozoic layered ultramafic–mafic intrusions of the Fedorovo-Pana Tundras has a long and fascinating history that continues to this day, despite occasional interruptions. As early as 1935, F. P. Kharchenko discovered disseminated sulfide mineralization of the copper-nickel type in the lower part of the Fedorova Tundra Massif. For many years, exploration efforts focused exclusively on copper-nickel ores, but no economically viable deposits were identified. The mineralization proved to be sparse and low-grade, occurring 50–300 m above the basal contact of the intrusion, and was deemed non-industrial. In the rocks of the Pana Tundra Massif – later subdivided into the Western and Eastern Pansky Massifs – disseminated sulfides were first identified in 1963 by S. M. Chikhachev. Subsequent geological and geophysical work, led by V. V. Proskuryakov (Northern-Western Technical State University), revealed several occurrences of sulfide mineralization within the lower layered zone of the intrusions, 300–500 m above their basal contacts. However, these copper-nickel occurrences also proved subeconomic.

Interestingly, as far back as 1938, D. V. Shifrin detected traces of platinum and palladium (0.5–2 ppm combined) in sulfide-bearing gabbro-norites from the Fedorova Tundra Massif and suggested that even these low-sulfide copper-nickel ores might contain platinum-group metals. Elevated PGE contents (up to 4–5 ppm) were later confirmed in samples from the Fedorova Tundra and Western Pansky Massifs during the 1970s, though at the time these findings attracted little attention. The history of research into the Fedorovo-Pansky intrusive complex is comprehensively detailed in the paper by Pripachkin and Rundkvist (2011).

It was only in 1986 that researchers at the Geological Institute of the Kola Science Centre started systematic studies of the PGE potential of the Fedorovo-Pansky complex. In 1987, N. N. Veselovsky noted the remarkable geological similarities between this complex and the platinum-bearing intrusions of Bushveld (South Africa) and Stillwater (USA). During the summer of 1988, a field team including Veselovsky, A. F. Troshkov, S. S. Razhev, and V. S. Dokuchaeva collected hand specimens from outcrops of low-sulfide copper-nickel mineralization in both massifs. On a well-exposed section near Maryok, zones of low-sulfide mineralization were traced over distances of up to 100–150 m. Laboratory analyses revealed elevated and, in some cases, high concentrations of platinum-group elements. These results provided the first scientific justification for considering the complex as a potential host for industrial PGE and associated mineralization. Furthermore, the findings supported forecasts for the discovery of polymetallic deposits enriched in Pd, Pt, Rh, Au, Cu, and Ni within the Fedorovo-Pana Tundras.

In 1988, Mitrofanov presented his theoretical model predicting this type of mineralization to Academician G. I. Marchuk, then President of the USSR Academy of Sciences, on the occasion of Marchuk's visit to Apatity. Recognizing the importance and promise of this research, Marchuk offered crucial support, i. e., allocating funds for drilling and analytical equipment required to study the PGE-bearing horizons. As a result, in 1989, the Geological Institute successfully drilled four boreholes at the Suleypakh site within the lower layered zone of the Western Pansky Massif, each intersecting multiple intervals of complex PGE mineralization.

Analysis of the collected data enabled Mitrofanov to propose the existence of the Kola PGE-bearing Province in 1989 (Mitrofanov et al., 1994 a, b; 1999 b; 2004; 2012; Mitrofanov, 2009). The concept was subsequently presented to all relevant scientific and industrial organizations.

In early 1990, at the meeting of the Scientific Council of the Geological Institute of the Kola Science Centre, with the support of L. A. Vinogradov, I proposed conducting detailed geological mapping of the Lower Layered Horizon, from the Maryok area to the Eastern Kievey site in order to assess the economic significance of the newly identified occurrences of low-sulfide platinum-group element mineralization. The plan included channel sampling of all known and newly discovered outcrops bearing low-sulfide mineralization, with the aim of determining the scale of ore distribution.

Felix Petrovich Mitrofanov *en route* to the Fedorovo-Pansky Massif with Mikhail Vasilievich Antropov, Mayor of Apatity, and Yury Leonidovich Voytekhovsky, Director of the Geological Institute of the Kola Science Centre, 2008

Not all members of the Scientific Council supported this initiative. Nevertheless, Felix Petrovich Mitrofanov, as Director of the Institute, made the decisive choice to proceed with the proposed program. Thus, in the summer of 1990, a field team of eighteen geologists was dispatched to the western part of the Pana Tundra Massif for a two-and-a-half-month expedition.

It was time to bring the scientific forecast to life. Detailed geological mapping and interpretation were carried out in the lower part of the Western Pansky Massif in order to study the extent and internal structure of the layered rock series and the distribution of associated complex mineralisation. The research was provided by a skilled team including N. N. Veselovsky, L. A. Vinogradov, E. M. Bakushkin, Yu. L. Voitekhovsky, N. L. Balabonin, A. U. Korchagin, A. S. Osokin, Yu. N. Yakovlev, A. F. Troshkov, A. I. Mednikov, S. M. Karpov, and others. In result, a PGE-bearing zone of low-sulphide type within the layered horizon, later named the Northern Platinum Reef, was identified, sampled and traced over a distance of some 11.5 km.

The Western Pansky Massif. Discussion and field verification of the position and extent of the Northern PGE-bearing Reef. In the centre, on the left – A. U. Korchagin, Director and Chief Geologist of Pana JSC; on the right – Academician F. P. Mitrofanov. The remaining participants are staff members of Pana JSC and the Geological Institute of the Kola Science Centre RAS

Location of low-sulphide complex platinum-palladium ore deposits (yellow stars) within the layered intrusions of the Fedorovo-Pana Tundras

The investigations revealed that the layered horizon hosting the Northern Platinum Reef is represented by a succession of weakly differentiated gabbro-norites containing contrasting interbeds of leucogabbro and anorthosite of varying thickness, as well as thin rhythmic alternations of leucocratic and melanocratic rocks. The ore-bearing zone (reef) displays a lens-shaped, banded structure arranged in *en échelon* pattern. The thickness of the ore lenses varies from several tens of cm to 3–6 m, while the total platinum-group element (PGE) content ranges from 2–3 to 6–8 ppm, with a typical platinum-to-palladium ratio of about 1:5. Several key exposures of economic interest were delineated, notably Eastern Kievey on the eastern flank and Severny Suleipakhk on the western. In 1991, the Institute's drilling unit completed four boreholes at the Central Kievey site and sixteen boreholes at the Eastern Kievey (Korchagin et al., 2009).

The results of these studies became one of principal arguments for recognising and substantiating a new Kola PGE-bearing Province (Mitrofanov et al., 1994 a, b; 1999 b).

To accelerate the assessment of the identified mineral occurrences and to attract the necessary investment, an innovative enterprise called Pana was established in 1992 on the basis of the Geological Institute (principally from the staff of the Laboratory of Platinum-Metal Ore Genesis), with some staff from other institutes of the Kola Science Centre. The enterprise was later reorganised into a joint-stock company and granted a 25-year licence for prospecting, exploration and extraction of low-sulphide platinum-metal ores within the Pansky Massif on an entrepreneurial-risk basis (Malaya Pana project). Academician F. P. Mitrofanov served as Chairman

of the Board of Directors; A. L. Gritsai acted as General Director from 1992 to 1999, and A. U. Korchagin held the position of Chief Geologist, becoming General Director from 2000 onwards.

At the initial stage, a series of boreholes between 20 and 100 m deep confirmed the presence of the ore zone near the surface at the Eastern Kievey site, tracing it for more than 700 m. Subsequent drilling in the central and western sectors of the established reef confirmed the continuity of mineralisation, with indications that the ore zone extends beyond the licensed area.

Results of pilot tests suggested positive potential for the beneficiation potential of the platinum-metal ores. In a trial open pit at Eastern Kievey, about 1400 t of complex platinum-metal ore were prepared for extraction.

These promising results enabled Felix Petrovich Mitrofanov to attract both attention and financial support for further exploration from the major Australian mining company Broken Hill Proprietary (BHP) in 1992. At the time this company was constructing the Hartley plant in Zimbabwe for the production of platinum metals from Great Dyke ores. BHP and Pana JSC established a joint venture, International Resources ZAO, with ownership shares of 80 % for BHP and 20 % for Pana JSC. In 1993, Pana JSC received a five-year licence for the geological study of the entire Fedorovo-Pansky intrusive complex. The BHP exploration team was led by Don Schissel.

With BHP's financial backing, geologists from the Geological Institute of the Kola Science Centre RAS and Pana JSC, including E. M. Bakushkin, Yu. L. Voytekhovsky, N. L. Balabonin, A. U. Korchagin, A. S. Osokin, A. F. Troshkov, A. I. Mednikov, and S. M. Karpov, carried out detailed geological mapping, drill-core documentation and sampling, and the construction of geological cross-sections for the Severny and Yuzhny Suleipakhk areas of the Pansky Massif, as well as for the Maly, Sredny, and Bolshoy Ikhtegipakhk areas of the Fedorova Tundra Massif. Drilling operations were conducted by the Murmansk Geological Survey Expedition and the Central Kola Expedition.

These efforts revealed, in the lower part of the Fedorova Tundra Massif, extensive zones of low-sulphide copper-nickel mineralisation enriched in PGE and gold. The ores were relatively low-grade but considerably thick, suggesting the potential for a large-scale platinum-metal deposit comparable to South Africa's Platreef, particularly in the Bolshoy Ikhtegipakhk area (Schissel et al., 2002). However, in 1999, BHP sharply reduced its global exploration activity and withdrew from the project.

To continue exploration for platinum-metal mineralisation in the eastern part of the Pana Tundra Massif, Pana JSC prepared a project aimed at identifying new PGE-bearing sulphide horizons (reefs) and assessing their potential for further study. The project was approved by the Geological Committee of the Murmansk Region

Eastern Pansky Massif. Discussion of the horizons with PGE mineralisation in the Chuarvy area. From left to right: A. U. Korchagin, V. Yu. Kalachev, F. P. Mitrofanov; V. P. Pavlov, K. O. Dudkin, V. V. Subbotin

and financed from the regional budget through the mineral resource reproduction fund. Between 2000 and 2001, several new low-sulphide horizons with elevated PGE contents were identified, although work was suspended in December 2001 due to budget constraints.

In 2002, at the invitation of the Ministry of Natural Resources, I presented Pana's findings to Deputy Minister A. E. Natalenko, who proposed engaging the Canadian company Bema Gold, then active in the Magadan Region. The exploration licence was subsequently transferred to the newly formed Kola Mining and Geological Company LLC. With financial support from Bema Gold, exploration of the Eastern Pansky Massif resumed in 2002–2004. As a result, geologists from the Geological Institute of the Kola Science Centre and Pana, i. e., A. U. Korchagin, S. M. Karpov, V. V. Subbotin, K. O. Dudkin, A. N. Kulakov, V. P. Pavlov, T. V. Rundkvist, A. F. Troshkov, A. I. Mednikov, among others, discovered and preliminarily evaluated the Eastern Chuarvy deposit.

The deposit was explored to a depth of 250 m, and by 2006 its ore and metal reserves were officially approved and entered into the State Reserves Register. Although

modest in size, the deposit boasts favourable average grades (Pt + Pd = 7.2 ppm) with a Pd/Pt ratio of 2.1.

In 2001, at the Minex Eurasia International Conference held in Moscow, I presented a report on the platinum-metal mineralisation of the Fedorovo-Pansky intrusive complex and on Pana's activities. During a break, representatives of the Russian branch of the major Canadian company Barrick Gold Corporation approached me, expressing keen interest in our projects. That meeting marked the beginning of a new and more dynamic phase in the exploration, evaluation, and development of PGE deposits in the region. With Barrick Gold's financial backing, reconnaissance and evaluation drilling began in 2001 across the Malaya Pana licence area – from the Maryyok site to Eastern Kievey, covering a 6-km stretch along the Northern Reef – with the aim of identifying the most metal-rich and promising zones. By drilling 26 boreholes spaced at 200-m intervals, the continuity of the Northern Reef along its strike was confirmed. Two extensive ore bodies were identified, and based on the estimated reserves, the site was recommended for detailed exploration. However, the scale of the deposit did not meet the expectations of Barrick Gold, and the company decided not to pursue further work on this target.

Fedorova Tundra Massif. Beside one of the exploration boreholes. From left to right: F. P. Mitrofanov, V. V. Subbotin, G. L. Vursiy, A. U. Korchagin, K. O. Dudkin

Drilling 26 boreholes at 200-m intervals demonstrated the continuous extent of the Northern Reef along its strike, revealed two substantial ore bodies, and, on the basis of the estimated reserves, indicated their suitability for further exploration. However, the scale of this deposit did not attract Barrick Gold.

Between 2001 and 2003, thanks to funding from Barrick Gold, evaluation works were carried out on the Fedorova Tundra licence area. In result, 60 boreholes were drilled, totalling more than 16 000 linear m. The ore was positively assessed. To commence full-scale exploration of the Fedorova Tundra, it became necessary to reorganise International Resources ZAO into Fedorovo Resources ZAO, transferring an 80 % stake to Barrick Gold, while Pana JSC retained its 20 % share.

As a major foreign investor, Barrick Gold placed considerable emphasis on drilling operations to obtain the most complete information on the geological structure of the massif and its mineralisation. The company demanded an exceptionally high (almost 100 %) core recovery – something that our drilling rigs at MGRE and CKÉ were unable to guarantee. Consequently, in February 2004, Pana JSC purchased a Canadian Boart Longyear LF-70 drill rig, followed in 2005 by a second Boart Longyear LF-90, establishing its own drilling service. Barrick Gold provided an interest-free loan to finance the first rig.

From 2004 onwards, large-scale evaluation and exploration works were deployed across the Fedorova Tundra, culminating in the discovery of the Fedorova Tundra deposit of low-sulphide, complex platinum-palladium ores. In 2006 alone, 245 boreholes were drilled, totalling 60 000 linear m. All core was documented, cut, and sampled, with over 32 000 samples prepared for chemical analysis and assayed for Pd, Pt, Rh, Au, Cu, and Ni. The data were fully processed and analysed jointly by Barrick International Ltd (Russia) and Pana JSC.

By 2007, the ore and metal resources of the deposit were certified and registered with the State Commission on Mineral Reserves (GKZ), and by the end of 2008, following additional exploration on the neighbouring Pakhvarak block, reserves were nearly doubled. Thanks to the sustained efforts of Barrick Gold in collaboration with Pana JSC, the deposit is now ready for commercial exploitation. The work involved staff from both the Geological Institute of the Kola Science Centre RAS and Pana JSC, including A. U. Korchagin, V. V. Subbotin, Yu. V. Goncharov, G. A. Vursiy, K. O. Dudkin, I. I. Yegoshin, A. S. Osokin, P. V. Pripachkin, D. A. Gabov, and others.

After Barrick Gold withdrew from funding the Malaya Pana project, the initiative attracted the interest of the domestic UralMinerals LLC company, which, together with Pana JSC, established the Malaya Pana LLC enterprise. As a result of exploration carried out between 2005 and 2007, with financial support from this

Russian investment company, the 6-km long Kievey deposit of complex platinum-group metal ores was delineated. Its reserves were certified by GKZ down to 200 m, with forecasted resources extending to 500 m from the surface. At favourable palladium market prices, the deposit showed clear economic potential. The work involved personnel from both the Geological Institute of the Kola Science Centre RAS and Pana JSC.

In 2009, Barrick Gold approached the Government of the Russian Federation for permission to construct a mining and processing facility at the Fedorova Tundra deposit, extracting and processing low-sulphide platinum-group ores. This followed the enactment of the new Subsoil Law in September 2008, which limited foreign participation in such enterprises to no more than 10 per cent. Two and a half years later, the Ministry of Natural Resources of the Russian Federation recommended a detailed study of the entire licensed area, with particular attention to prospective ore occurrences. Pana JSC prepared a project, which Barrick Gold financed. Between 2012 and 2015, Pana JSC conducted comprehensive exploration and assessment works. In the lower stratified horizon of the western sector of the Pana Tundras, the continuity of the Northern Reef was firmly established, and, most notably, a new platinum-group metal deposit – the approximately 5 km-long Northern Kamenik – was discovered and delineated. Its reserves were certified by the GKZ in 2015 and entered onto the state balance.

At present, Pana JSC operates five Boart Longyear drill rigs (LF-70, LF-90, LF-90 LS, and two LF-90 C) for surface drilling, as well as three underground rigs: LM-75 (Australia), SDS-400 (Turkey), and RU-75 (Russia, an analogue of the LM-75). Over the course of thirty years of exploration within the Fedorovo-Pansky intrusive complex, Pana JSC has attracted more than USD 90 million in foreign investment, including USD 70 million from Barrick Gold, alongside approximately 600 million roubles from the federal budget and Russian investors.

These endeavours led to the discovery of four deposits of low-sulphide platinum-group ores, a testament to the scientific vision, organisational acumen, and innovative spirit of Felix Petrovich Mitrofanov and the team at Pana JSC. The establishment of Pana JSC remains a striking example of how an academic institution can successfully transform research into tangible economic achievements.

In 2009, Academician F. P. Mitrofanov and A. U. Korchagin were awarded the V. V. Smirnov Prize for the discovery of the Kola PGE-bearing Province. The fundamental and applied research of Mitrofanov and members of his scientific school has been consistently supported by the Earth Sciences Department RAS, the Russian Foundation for Basic Research (RFBR), and joint RFBR–OFI-M programmes and grants.

In 2011, Felix Petrovich Mitrofanov, Doctor of Geological and Mineralogical Sciences, Academician of the Russian Academy of Sciences, and Chief Researcher at the Geological Institute of the Kola Science Centre RAS, was awarded the State Prize of the Russian Federation in Science and Technology for the scientific substantiation and discovery of major platinum-palladium deposits on the Kola Peninsula. The official presentation of the award took place at the Kremlin on 12 June 2012.

Moscow, Kremlin, 12 June 2012. Presentation of the State Prize to F. P. Mitrofanov by the President of the Russian Federation, V. V. Putin

Thus, the discovery of PGE deposits within the Fedorovo-Pansky complex vividly demonstrated Felix Petrovich Mitrofanov's exceptional organisational talent, his ability to initiate large-scale international projects, and his skill in attracting substantial investment to successfully address complex geological challenges. While the Fedorovo-Pana project carried immense applied significance, many other initiatives led by Academician Mitrofanov were of equal importance for fundamental research. Among these, the study of the unique Kola Superdeep Borehole (SD-3) section unquestionably stands out.

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Recollections of Researcher at the Geological Institute, Kola Science Centre RAS, Doctor of Technical Sciences Felix Felixovich Gorbatsevich

In January 1986, Felix Petrovich Mitrofanov was appointed Director of the Geological Institute. One of his first actions was to conduct a "review" of the staff's projects and research themes. We all prepared little posters showcasing our work and achievements, drawn as best as we could.

During a planning meeting for a potential international project in Zapolyarny. From right to left: F. P. Mitrofanov, D. M. Guberman, and Y. N. Yakovlev

Discussion on the potential scientific project for the study of the Kola Superdeep Borehole (SD-3) stratigraphy. Strasbourg, France, 1997

Felix Petrovich Mitrofanov delivering a speech at the opening of the inaugural meeting, Zapolyarny, 1998

The impression of who was doing what was formed not only by the new director but by all of us. The second major initiative of Felix Petrovich, as I recall, was to launch detailed studies of the Archaean geodynamic Voche-Lambina Test Site. It lies just a few dozen km from the Institute, making its accessibility one of its advantages. Yet its structural and formational architecture is highly complex, situated at the junction of the Kola and Belomorian megablocks. Each researcher at the Institute could demonstrate their potential by conducting in-depth investigations of unique features of the site. In fact, virtually the entire Institute participated in the survey, geologists and geophysicists alike. I also took part, applying my acoustic-polarisation method.

The culmination of these efforts was the publication, in 1991, of a monograph integrating petrographic, petrological, petrochemical, geophysical, and other results, reflecting the collective achievements of the team.

From 1989 onwards, Felix Petrovich became actively engaged in international scientific cooperation. He co-led the IGCP Project No. 275 Deep Geology of the Baltic (Fennoscandian) Shield, and coordinated several INTAS projects.

At that time, the world's attention was drawn to the unique Soviet scientific endeavour of drilling the Kola Superdeep Borehole (SD-3) near the town of Zapolyarny. By December 1983, the borehole had reached a depth of 12 km, a record depth anywhere on Earth. During the drilling, our scientists studied the composition, structure, and physical properties of crystalline rocks and minerals under extreme conditions, including the isotopic composition of noble gases and hydrocarbons.

Felix Petrovich recognised that involving foreign scientists, with their novel and powerful analytical techniques, could greatly enhance both the scope and the value of the scientific knowledge derivable from the SD-3 core and stratigraphic section. By combining the resources of the Academy of Sciences, the Ministry of Geology, and leading international institutes, it would be possible to achieve results of global significance. With this vision, we travelled to Zapolyarny to meet the expedition leader, David Mironovich Guberman. I must say that David Mironovich quickly appreciated the magnitude of the proposal. What remained was to identify eminent foreign scientists interested in working on SD-3 and to organise an international project within which the research could be systematically undertaken.

Such scientists were soon found, given the international recognition of the significance of the SD-3 project. Professor H.-J. Kümpel from Germany, who had conducted similar studies on the superdeep KTB borehole, expressed a strong interest in participating in the SD-3 project. Professor H. Kern indicated that he could make a valuable contribution to the petrophysical study of deep crustal and overlying rocks, as well as elucidate the relationships between seismic velocities, anisotropic structures, and the composition of the continental lithosphere.

Participants of the inaugural meeting against the backdrop
of the Kola Superdeep Borehole (SD-3), Zapolyarny, 1998

Proposals were also received concerning geothermal research (Dr. Ilmo Kukkonen, Finland), the study of crustal evolution (Dr. B. A. Sturt, Norway), deep structural, petrophysical, and geophysical modelling (Professor V. I. Starostenko, Ukraine), and anisotropy (Dr. Z. Pross, Czech Republic). They were soon joined by Professor D. K. Smith (University of Glasgow, United Kingdom), Professor A. E. Fallick (Research Reactor Centre, Scottish Universities), Professor S. B. Smithson (University of Laramie, USA), among others.

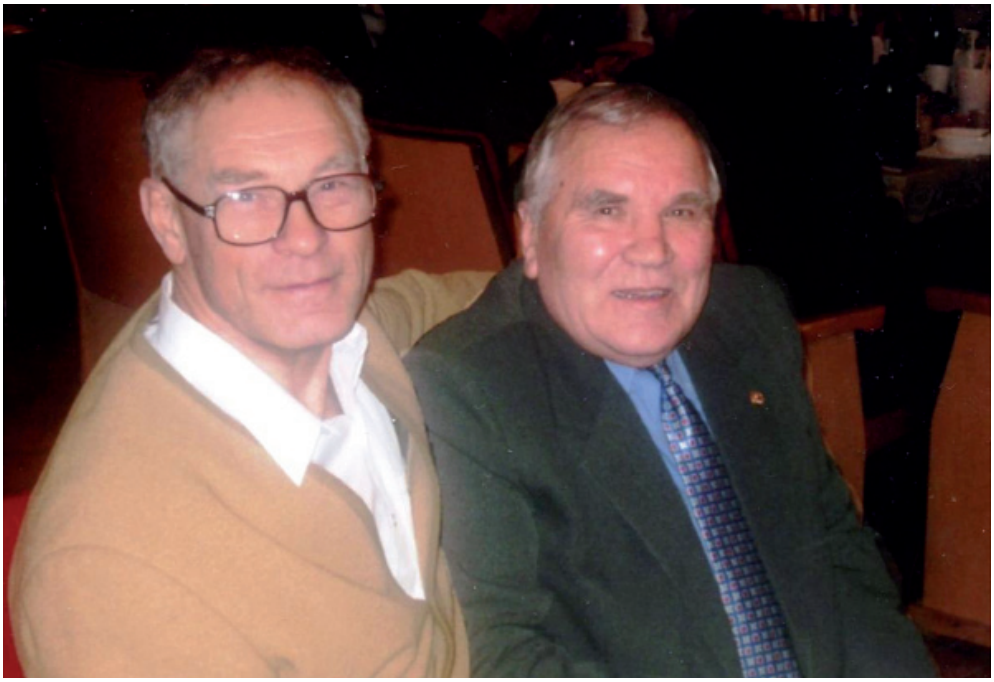
A question immediately arose: under which international framework should these investigations be conducted? Felix Petrovich had prior experience leading International Geological Correlation Projects (IGCP) initiatives supported under the auspices of UNESCO. These projects fund the organisation of joint scientific symposia and conferences. Preliminary discussions regarding support for such a project were conducted by Felix Petrovich at the IX Meeting of the European Association of Geological Societies (MAEGS) in St Petersburg, Russia (September 1995); at the XXX International Geological Congress (IGC) in Beijing, China (August 1996); at the IX Symposium of the European Union of Geosciences (EUG) in Strasbourg, France (March 1997); and at the XXII General Assembly of the European Geophysical Societies (EGS) in Vienna, Austria (April 1997). These efforts successfully attracted a significant number of experts who viewed the project favourably.

Ultimately, the theme and primary focus of the project were defined as: “Comparison of the composition, structure, and physical properties of rocks and minerals along the Kola Superdeep Borehole (SD-3) and their analogues at the Earth’s surface.” Co-leaders were appointed as Felix Petrovich Mitrofanov, David Mironovich Guberman, and H.-J. Kümpel (Germany), with myself as project secretary. A full project proposal was drafted and submitted to the IGCP committee for consideration. In the spring of 1998, the committee secretary, V. Babushka, informed us that the project had been approved and assigned the number IGCP-408. The inaugural conference took place in early September. I recall that one of the first to arrive in Zapolyarny was Ilmo Kukkonen. That evening, we walked through the town together, during which he explained that prior to the war, the area now occupied by Zapolyarny and Liinakhamari had belonged to Finland.

Presentations at the conference were delivered by Felix Petrovich Mitrofanov, David Guberman, V. I. Kazansky, V. R. Vetrin, J. Ludden (United Kingdom), Ilmo Kukkonen (Finland), and others. The proceedings concluded with a formal dinner at a local restaurant. H.-J. Kümpel even brought the project funds concealed on his person to avoid declaring them at customs. Subsequently, participants divided into thematic groups according to their areas of interest and commenced standard research

Evening gathering on the eve of the conference. Women’s monastery,
the town of Windischeschenbach, southern Bavaria, 2001

Felix Petrovich with his friend Cornelius Gillen from the United Kingdom



New Year's Eve at the Geological Institute of the Kola Science Centre
of the Russian Academy of Sciences, December 2003.
From left to right: F. F. Gorbatsevich and F. P. Mitrofanov

activities: data collection, analysis, synthesis, and the formulation of conclusions. As was customary, the project secretary was responsible for preparing the official report.

After a year of work, the next meeting of the project participants was once again held at the beginning of September 1999, initially in Apatity and then in Zapolyarny. Reports were presented on the research conducted over the preceding year. Attendance was larger than in 1998, with Professor S. Smithson arriving from the United States, Katja Schulze from Germany, and Dr. I. Trchkova and T. Lokajicek from the Czech Republic. F. P. Mitrofanov, D. M. Guberman, H.-J. Kümpel, V. R. Vetrin, N. E. Kozlov, V. N. Komlev, and others delivered their presentations. Earlier, Professor S. Smithson had organised the geophysical profiling work along a line intersecting SD-3. This required transporting a vibroseis source and seismic wave recorders on large vehicles to the Kola Peninsula. His report focused on the results of this large-scale experiment.

The following joint project conference took place in Prague on 24–28 September 2000, under the auspices of the Institute of Rock Structure and Mechanics of the Czech Academy of Sciences. It was a very memorable trip. We travelled by train from Moscow, departing from the Belorussky Railway Station, crossing Belarus and Poland under splendid sunny skies. We were warmly welcomed upon arrival in the Czech Republic. Professor H. Kern delivered a highly engaging report on the study of elastic anisotropy in rock samples from the SD-3 core and their surface analogues. Other presentations covered the full spectrum of project research.

On the streets of Prague, we encountered a very unusual public phenomenon for us: an anti-globalisation protest. Young people, scantily clad and adorned with tattoos, marched through the streets to the beat of drums, chanting slogans about insufficient unemployment benefits. They had gathered in Prague from across Europe. It was a striking and unforgettable spectacle.

The fourth IGCP Project No. 408 Conference was held in Windischeschenbach in southern Bavaria, near the German Superdeep Borehole KTB-NW, which reached a maximum depth of 9 100 m. A substantial Russian delegation of over twenty people attended. We were accommodated in a charming Catholic convent, where elderly nuns provided our breakfasts and lunches. The working sessions were from 3 to 8 September 2001, featuring numerous interesting and substantial presentations. We visited the KTB-NW borehole, where the onsite facilities were meticulously organised in classic German fashion. We were shown a video on the drilling process and the structure of the Earth's interior. Core samples, fossils, video materials, and souvenirs were available for sale. Any visitor, with or without family, could come to the borehole, watch the videos, purchase mementoes, and, most importantly, gain

firsthand understanding of the structure of our planet. Schoolchildren and university students frequently visit KTB-NW to acquire knowledge directly from the source. Against this backdrop, the fate of our remarkable Kola Superdeep Borehole appears regrettably neglected. This technological and scientific world record remains largely forgotten.

The final project meeting for IGCP Project No. 408 was held, as with the first, in Zapolyarny. Detailed and substantial presentations were delivered by H.-J. Kümpel, V. I. Kazansky, I. Kukkonen, A. V. Zharikov, V. I. Sholpo, J. Spichak, K. Gillen, T. B. Bayanova, Yu. P. Smirnov, and others. Professor Eduardo de Mulder, President of the International Union of Geological Sciences (IUGS), also participated. The IUGS unites 240 000 geoscientists worldwide. The concluding discussion established that, overall, the project objectives had been successfully achieved.

The research results were published in several volumes of articles, including two special issues of the "Vestnik of Moscow State Technical University". Upon completion of the project, F. P. Mitrofanov shifted his principal focus to the exploration and preparation for industrial development of platinum-group metal deposits in the Pansky Massif, achieving outstanding results in this field.

Felix Petrovich was an exceptionally talented and remarkable individual. Possessing an extraordinary memory and wide-ranging erudition, he was a formidable interlocutor and could discuss any topic, including complex issues in petrography, petrology, geochemistry, and geochronology. Above all, he was a superb organiser. He treated all institute staff with respect, both collectively and individually. The Academic Council meetings he chaired were full of a democratic spirit: any staff member, even a laboratory assistant, could attend and voice their opinion. He allowed speakers to completely present their points, sometimes at the expense of time. He immediately grasped the essence of issues and advised colleagues on the best way to resolve them. His criticism was measured and constructive. He protected staff from overly aggressive critiques by others. He could appear as a kindly grandfather, yet was fully capable of taking firm and decisive action.

Undoubtedly, his extraordinary organisational skills, the scientific significance of the IGCP Project No. 408, his ability to unite a large group of leading international and domestic scientists, and the excellent results achieved were decisive in his election as a member of the Russian Academy of Sciences. Under his leadership, the Geological Institute of the Kola Science Centre attained a new elevated status.

Continuing the theme of Felix Petrovich's extensive international contacts, we can share a brief, touching vignette recorded by one of his considerably younger foreign colleagues during the farewell in 2014…

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Recollections of Associate Professor at the Department of Geology, Soil Science, and Information, Faculty of Earth Sciences, Maria Curie-Skłodowska University (Lublin, Poland) Milosz Huber

Professor Felix Petrovich Mitrofanov was a remarkable person, both in the realm of scientific achievement and in his personal life. My memories of travels to the Kola Peninsula are inseparably linked to him – his warmth, attentiveness, and readiness to help were ever-present. On numerous occasions, Felix Petrovich ensured that my stay in Apatity was comfortable and offered invaluable assistance in organising field expeditions.

Geological Institute of the Kola Science Centre of the Russian Academy of Sciences, summer 2008. From left to right: M. Huber and F. P. Mitrofanov

Geological Institute of the Kola Science Centre RAS, summer 2008.
F. P. Mitrofanov with M. Huber's mother

Felix Petrovich offered his support selflessly, demonst-rating immense patience as we awaited the results of analyses. Thanks to this outstanding person, always modest and ever ready to help, numerous scientific works were produced here in Poland, using materials he generously provided.

I first met him in 1999 during my initial visit to Apatity. Later, in 2001, at the SGA-SEG conference on mineral resources, he visited Kraków. From that point on, whenever I came to Apatity, we would meet in a more or less formal setting to discuss not only scientific matters but also life itself. Thanks to Professor Felix Petrovich Mitrofanov and the staff of the Kola Science Centre, Apatity became a very special place for me. On the Kola Peninsula, I met my wife to be and collected rock samples for my research. When I began working in Lublin, the opportunity arose to establish a laboratory for optical and electron microscopy. Finally, it became possible to accelerate research and strengthen collaboration. I had always hoped to invite Professor Felix Petrovich Mitrofanov, at least symbolically, to express my gratitude for his help – but I never had the chance…

Dear Felix Petrovich, you were like a father to us, always ready to support and guide both in word and deed. Today, it is deeply painful to realise that we can no longer meet you. Yet in our memories and in our hearts, you will remain forever.

Field works. Kolvitsa, June 2003.
From left to right: M. Huber and F. P. Mitrofanov

“Tietta” Recreation Centre of KSC RAS, 2010. From left to right: an Indian colleague, Talat Ahmad, Professor Svens, M. Huber, and F. P. Mitrofanov

However, it would be inappropriate to end our book on a somber note. It is important to emphasise that Felix Petrovich was often ahead of his time, always looking years into the future. He consistently thought about prospects and planned for what lay ahead. In this context, Academician Mitrofanov showed great concern for the next generation and for young professionals at the Geological Institute of the Kola Science Centre RAS.

To support emerging scientists, Felix Petrovich established a dedicated scientific school and closely oversaw the organisation of the annual youth scientific conference, held in memory of his mentor, Kauko Ottovich Kratz. He actively encouraged young staff to participate in RFBR youth projects, motivating and guiding them to complete fully-fledged PhD theses within their postgraduate studies. He consistently supported the defence of these dissertations, often personally assisting his colleagues in specialised academic councils.

Perhaps one of the most significant steps in building a reliable pipeline of young talent for the Institute was the establishment of a branch of the Murmansk Technical University in Apatity, along with the creation of a Department of Geology and Mineral Resources. This initiative ensured a steady influx of young specialists into the Institute, securing its scientific future.

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Recollections of Directors of the Apatity Branch of the Murmansk State Technical University (AB MSTU) Doctor of Geological and Mineralogical Sciences, Professor Nikolay Evgenievich Kozlov (1996–2017), and Candidate of Geological and Mineralogical Sciences Igor Vladimirovich Chikirev (2017–2023)

When speaking of Felix Petrovich Mitrofanov, it is impossible to overlook another facet of his multifaceted career – higher education. This story dates back to the 1990s. Following the collapse of the USSR, the question of staffing became acute across many organisations in the country. Graduates from central universities were eager to avoid moving to the periphery, often at the cost of turning down opportunities in their own specialisations.

Across Russia, a wave of establishing numerous branch campuses of various universities swept through, aimed at partially meeting the personnel needs of regional enterprises and scientific institutions. Murmansk Region was no exception. In 1994, the Kola Branch of the Petrozavodsk State University (Petrozavodsk) was established in Apatity, followed shortly thereafter by a branch of INZHEKON (St. Petersburg). These branches focused on training economists, lawyers, philologists, mathematicians, and biologists.

This context set the stage for the creation of another regional branch, specifically designed to provide the area with specialists in geology, mining, geoecology, and chemistry – fields crucial for the region's scientific and industrial development.

Staff of the Geological Institute, the newly established Apatity Branch, and the leadership of MGARF/MSTU, 1999.
From left to right: E. V. Kasparyan (Geological Institute KSC RAS), T. B. Bayanova (Geological Institute KSC RAS), A. P. Galyanov (Rector of MGARF, later MSTU), V. F. Shtykov (First Vice-Rector, MGARF), N. E. Kozlov (First Director of the Apatity Branch), L. D. Kirillova (Head of Academic Affairs, Apatity Branch, MSTU).

At the end of 1994, a team from the Geological Institute of the Kola Science Centre of the Russian Academy of Sciences – including the head of one of its laboratories, Doctor of Geological and Mineralogical Sciences N. E. Kozlov, and the institute's deputy directors, Candidates of Geological and Mineralogical Sciences A. A. Ivanov and V. A. Pripachkin – together with the First Vice-Rector of the Murmansk State Academy of Fisheries Fleet (MGARF), Associate Professor V. F. Shtykov, proposed a joint programme to train geologists, combining the expertise and teaching efforts of the Institute's researchers with MGARF faculty. This initiative was supported by the Institute's Director, then Corresponding Member RAS F. P. Mitrofanov, and the Rector of MGARF, later Murmansk State Technical University, A. P. Galyanov. It was decided to establish a new educational structure in Apatity, with N. E. Kozlov taking responsibility for its development on a voluntary basis.

During the preparatory phase, several meetings were held under the realm of the Presidium KSC RAS and heads of its major institutes. As a result, in February 1995, MGTSU and KSC RAS signed a protocol to establish a university branch

in Apatity, Murmansk Region, based at the Kola Science Centre. This branch was intended for the joint training of specialists in natural and technical fields and for providing personnel for the institutes of the Kola Science Centre.

In April 1996, N. E. Kozlov was appointed Director of the branch faculty, and by the end of the year the first department – Geology and Mineral Resources – was established, with Corresponding Member RAS F. P. Mitrofanov appointed as its head. Considerable support in organising both the branch and its departments was provided by the Murmansk Regional Duma, particularly A. A. Ivanov, who was elected as a deputy from Apatity in 1996. Significant contributions were also made by the branch Deputy Director I. V. Chikiryov and Head of the Academic Office L. D. Kirillova. Nevertheless, the role played by F. P. Mitrofanov in the creation and development of the branch was crucial. From the very beginning, the leadership of the Geology and Mineral Resources Department faced a number of challenges, in resolving which Felix Petrovich took an active part.

Following the 1996 admissions campaign, which was held in Murmansk at the main university, it became clear that the number of applicants for geology was extremely low. This was understandable, as training geologists at a "maritime" university initially raised many questions among school graduates and their parents. At the request of the branch leadership, a meeting was organised with those applicants who had successfully passed the entrance examinations (this was still

F. P. Mitrofanov at the defence of coursework at the Department of Geology and Mineral Resources, Apatity Branch of the Murmansk State Technical University

At the graduation thesis defence of students from the Department of Geology and Mineral Resources, Apatity Branch of the Murmansk State Technical University From left to right: supervisors and commission members: V. A. Pripachkin, T. B. Bayanova, E. V. Martynov, F. P. Mitrofanov, N. M. Kudryashov

before the introduction of the Unified State Exam) but had not been admitted due to their scores relative to the quotas for their chosen programmes. It should be noted that, unlike current rules, each applicant at the time had the right to enter a specific specialisation.

For this meeting, N. E. Kozlov invited F. P. Mitrofanov, and he accepted the invitation immediately. The presence of a Full Member of the Russian Academy of Sciences, particularly one so approachable and engaging in his discussion of geology, enabled the department to achieve full enrolment in the "Geology" programme and decisively shaped the future not only of the department but of the branch as a whole. In fact, this marked the true beginning of the branch's active life. Subsequently, additional departments were established, including Chemistry and Building Materials Science, Geoecology, and Mining Engineering. The work of the branch in these areas was supported by the directors of specialised Kola Science Centre institutes – at that time Corresponding Members RAS V. T. Kalinnikov and N. N. Melnikov, Doctor of Technical Sciences G. V. Kalabin, and later Corresponding Member V. K. Zhirov. However, the contribution of Felix Petrovich Mitrofanov to the development of the Apatity Branch of MSTU was, without doubt, far greater than

anyone else's. Moreover, he was personally involved in organising student education and took a genuine interest in their lives.

After the first year of studies, a pressing question arose: where should the first field geology practical be conducted? At that time, the branch had no established system for organising fieldwork, nor were there instructors prepared for such tasks. Mitrofanov, drawing on his contacts, arranged for the practice to take place in Sablino (Leningrad Region) at the Geological Faculty of the St Petersburg University. Furthermore, he assisted in securing funding for the trip. In subsequent years, the Apatity Branch developed its own infrastructure for field training, but that first, pioneering experience remained unforgettable for both the instructors and the first cohort of geology students.

In 2000, the Department of Geology and Mineral Resources pioneered the introduction of master's degree programmes in the Murmansk Region — an achievement made possible largely through the efforts of F. P. Mitrofanov. After several unsuccessful attempts to obtain a licence for master's programmes, the branch's Deputy Director I. V. Chikiryov brought the matter to Mitrofanov's attention. At the time, there was an unspoken "ban" on licensing master's programmes in university branches. Mitrofanov, a decisive man, took the relevant documents

F. P. Mitrofanov with faculty members and bachelor's graduates of the Department of Geology outside the MSTU Apatity Branch building. Apatity, 2009

from Chikiryov and, while in Moscow on other business, personally approached V. D. Shadrikov, Deputy Minister of Education of Russia. After explaining the situation, Mitrofanov left the meeting with the documents stamped: “Permit as an exception!”

The Apatity Branch of the Murmansk State Technical University (MSTU) became the third branch in all of Russia to be granted the right to offer master’s degree programmes.

Despite his extremely busy schedule, Felix Petrovich would begin each working day by visiting the department. A special office for the Head of Department had been organised and fully equipped there, and he spent a great deal of time in it, speaking with students. Moreover, among all his distinguished colleagues – many of them academicians – he was the only one who personally delivered a substantial number of lectures.

Felix Petrovich organised academic conferences for students and awarded cash prizes from his own personal funds for the best presentations. He was also a regular member of the committee for the defence of graduation theses.

F. P. Mitrofanov paid great attention to strengthening the department’s material resources. He established a departmental library that included a wide range of geological publications, among them rare editions– many of which he had purchased at his own expense.

Under Felix Petrovich’s leadership, a tradition was established that continues at the Institute to this day: the most promising students from the Department of Geology are invited to join the Geological Institute of the Kola Science Centre of the Russian Academy of Sciences. In this way, students begin to acquire research skills and professional experience while still at university.

Kauko Ottovich Kratz (1914–1983), a Soviet geologist and Precambrian specialist, an Honoured Scientist of the Karelian ASSR (1964), a Corresponding Member of the USSR Academy of Sciences (1968), and a posthumous laureate of the USSR State Prize (1985).

Many of them have continued their scientific careers at the Geological Institute of the Kola Science Centre, going on to hold positions such as Deputy Director for Research, Scientific Secretary, Head of Laboratory, and Leading Researcher. Today, nine graduates of the Department of Geology and Mineral Resources – including its postgraduate students – hold the academic degree of Candidate of Sciences.

The scientific school founded by Felix Petrovich Mitrofanov will continue to live on through his students.

Felix Petrovich's attention extended not only to undergraduate students but also to postgraduates, for whom he established a special youth school dedicated to his mentor, Corresponding Member of the USSR Academy of Sciences K. O. Kratz. Over the years, this school known as the Young Scientists' Conference has been attended by many distinguished geologists from Russia and abroad. Fittingly, the conference, which has long since become a tradition, is now dedicated to the memory of both Corresponding Member of the USSR Academy of Sciences K. O. Kratz and Academician of the Russian Academy of Sciences F. P. Mitrofanov.

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On 8 April 2019, a memorial plaque dedicated to Academician F. P. Mitrofanov was unveiled on the façade of the Federal Research Centre of the Kola Science Centre of the Russian Academy of Sciences. Speakers at the ceremony were former Head of the city of Apatity A. G. Gilyarov, Academician-Secretary of the Division of Earth Sciences of the Russian Academy of Sciences A. O. Gliko, Director of FRC KSC RAS S. V. Krivovichev, and Director of the Geological Institute KSC RAS N. E. Kozlov. Also speaking was Viktor Fyodorovich Shtykov, Candidate of Technical Sciences, who served as First Vice-Rector of the Murmansk State Technical University (1991–2001) and as First Deputy Chair of the Murmansk Regional Committee for Education (2001–2007). Provided below is his speech:

"*Today we unveil a memorial plaque in honour of one of the foremost scholars in the field of petrology and Precambrian geology, Full Member of the Russian Academy of Sciences and Laureate of the State Prize of Russia, Felix Petrovich Mitrofanov.*

For those of us who knew him well, this is both a joyful and deeply sorrowful occasion. Joyful – because we can once again focus our thoughts and hearts on the bright personality of Felix Petrovich Mitrofanov, on his pure and immortal soul. And sorrowful – because these moments of remembrance occur in circumstances that no longer allow us to see his charming smile, his inspiring gaze, or hear his encouraging voice.

In connection with today's event, I would like to recall two aspects of Felix Petrovich's activity that are particularly close to me and that I was privileged to witness personally.

First, Felix Petrovich could have been a most welcome colleague at any research centre anywhere in the world. Yet he remained forever a true and loyal patriot of Russia, embodying the finest qualities of the Russian spirit. During the most difficult years for Russian science, he not only preserved the oldest institute within the Kola Science Centre – the Geological Institute – but also strengthened its material and technical foundation and ensured the preservation and renewal of its research staff.

Second, the contribution of Felix Petrovich to the development of higher education in the Murmansk Region is beyond measure. He was among the first leading scientists and administrators of the Kola Science Centre to believe in the feasibility of training local geological specialists. He supported the creation of an educational division of the Murmansk State Technical University based at the Geological Institute KSC RAS, and personally took an active and practical role in teaching and mentoring future generations of geologists who would carry on his work.

These efforts were by no means in vain. I am certain that the energy, intellect, and organisational talent of Felix Petrovich – so generously passed on to the new generation of leaders and researchers of the Geological Institute of the Kola Science Centre – will enable this distinguished institute to remain at the forefront of Russian and global geological science today and for many years to come."

Apatity, 8 April 2019. Unveiling of the memorial plaque dedicated to Academician Felix Petrovich Mitrofanov.
From left to right: S. V. Krivovichev, A. O. Gliko, T. B. Bayanova, N. E. Kozlov.

IN PLACE OF A CONCLUSION

It is well known that the greatest legacy of any scientist lies in their students – those who carry forward their teacher's work. In this regard, Felix Petrovich Mitrofanov was a fortunate man: his dedication to nurturing young researchers at the Geological Institute of the Kola Science Centre of the Russian Academy of Sciences has borne remarkable fruit. Today, his former students make up virtually the entire leadership of the Institute. Among them are both Deputy Directors for Research – Candidates of Geological and Mineralogical Sciences A. V. Mokrushin and S. V. Mudruk – as well as the Scientific Secretary, Candidate of Geological and Mineralogical Sciences D. S. Tolstobrov. Quite recently, another of Academician Mitrofanov's students, Candidate of Geological and Mineralogical Sciences E. L. Kunakkuzin, was appointed Head of the Institute's key Laboratory of Geochronology and Isotope Geochemistry.

And a few more words in conclusion. Felix Petrovich passed away on 8 May 2014. Just a few months later, in August, the XII International Platinum Symposium was held in Yekaterinburg. During one of its scientific sessions, another of Mitrofanov's students – now an internationally renowned scientist, R. M. Latypov – delivered a presentation dedicated to the memory of his mentor.

Deputy Directors of GI KSC RAS, Cand. Sci. (Geol.-mineral.) S. V. Mudruk (left) and Cand. Sci. (Geol.-mineral.) A. V. Mokrushin (right)

Scientific Secretary of GI KSC RAS, Cand.Sci. (Geol.-mineral.) D. S. Tolstobrov

The final slide of the presentation featured a quote from Felix Petrovich himself: “The true success and deepest meaning of a geologist’s work is to see the development of the deposit he discovered.”

It is worth recalling that the development of the Fedorova Tundra deposit – the largest PGE-bearing deposit in Europe, which discovery owed much to Academician Mitrofanov’s efforts – was halted only by the global economic crisis of 2008.

After R. M. Latypov’s presentation, the audience – composed of leading international and Russian experts in platinum-group ore genesis – rose in a standing ovation to honor the memory of Felix Petrovich.

To all of us, he will forever remain a vivid personality, an accomplished scientist, and a gifted organizer of science.

Anniversary of the Department of Geology and Mineral Resources, Apatity Branch of MSTU. Apatity, 2006. F. P. Mitrofanov presents an award to A. V. Mokrushin, the department’s first graduate to successfully defend a PhD thesis

From left to right: D. S. Tolstobrov, S. V. Mudruk, and E. L. Kunakkuzin, now Head of the Laboratory for Geochronology and Isotopic Geochemistry at the Geological Institute of the Kola Science Centre RAS

Professor Rais Latypov, Petrology Department, University of the Witwatersrand (South Africa), delivering a presentation dedicated to the memory of Academician F. P. Mitrofanov at the XII International Platinum Symposium. Yekaterinburg, summer 2014

POSTGRADUATE STUDENTS OF ACADEMICIAN F. P. MITROFANOV

Felix Petrovich Mitrofanov supervised and trained a number of PhD and doctoral candidates.

Among his postgraduate students who successfully defended their dissertations were:

Ivan Konstantinovich Kozakov – "Granitoids in the Geological Development of the Precambrian of Western Sangilen (Tuva ASSR)", 1977, Candidate of Geological and Mineralogical Sciences.

Lyudmila Mikhailovna Samorukova – "Formation Conditions of Intrusive Granitoids in Early Precambrian Metamorphic Belts: Based on the Study of Mineral-Forming Inclusions and Fluid Composition", 1985, Candidate of Geological and Mineralogical Sciences.

Among the staff members of the Geological Institute of the Kola Science Centre RAS, who also successfully defended their theses were:

Vladislav Borisovich Alekseev – "Structural Development of the Neblogorsky Pegmatite Field, Northwestern Belomorye", 1989, Candidate of Geological and Mineralogical Sciences.

Rais Mirzakhanovich Latypov – "Petrology of the Platinum-Bearing Lower Layered Horizon of the Pansky Tundra Intrusion", 1994, Candidate of Geological and Mineralogical Sciences.

Tatyana Vladimirovna Kaulina – "U-Pb Dating of Zircons from Key Geological Objects of the Belomorian-Lapland Belt: Northwestern Belomorye", 1995, Candidate of Geological and Mineralogical Sciences.

Nikolay Olegovich Sorokhtin – "Geodynamic Evolution and Diamond Potential of the Eastern Part of the Baltic Shield", 1996, Candidate of Geological and Mineralogical Sciences.

Lyudmila Ivanovna Nerovich – "Petrology and Geochronology of the Anorthosites of the Lapland Granulite Belt", 1999, Candidate of Geological and Mineralogical Sciences.

Raisa Minzyanovna Galimzyanova – "Mafic Pegmatites of the Platinum-Metal Zones of the Monchegorsk, Pansky and Imandra Layered Intrusions: Petrology and Ore Potential Criteria", 2002, Candidate of Geological and Mineralogical Sciences.

Elena Anatolyevna Nitkina – "Geology and Geochronological Criteria for Differentiating Ore-Bearing and Barren Rock Associations in the Western Part of the Platinum-Bearing Fedorovo-Pansky Massif", 2006, Candidate of Geological and Mineralogical Sciences.

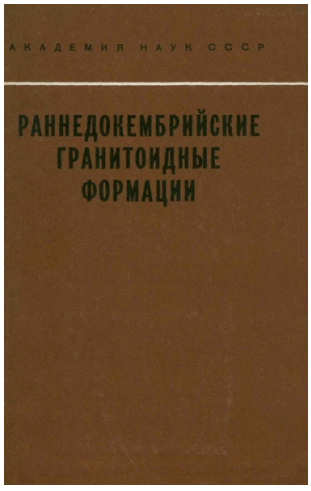
Pavel Alexandrovich Serov – "Age Boundaries of Platinum-Metal Mineralization Formation in the Fedorovo-Pansky Layered Intrusion Based on Sm-Nd and Rb-Sr Isotopic Characteristics", 2008, Candidate of Geological and Mineralogical Sciences.

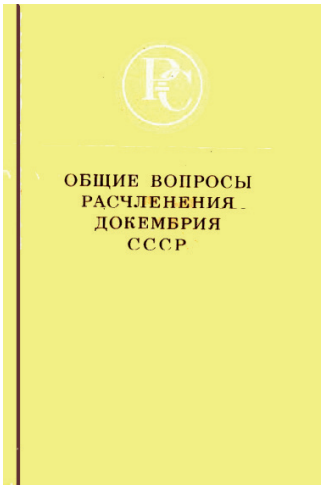
Dmitry Alexandrovich Gabov – "Minerals and Mineral Associations of PGE in Low-Sulfide Ores of the Pansky Tundra Massif", 2009, Candidate of Geological and Mineralogical Sciences.

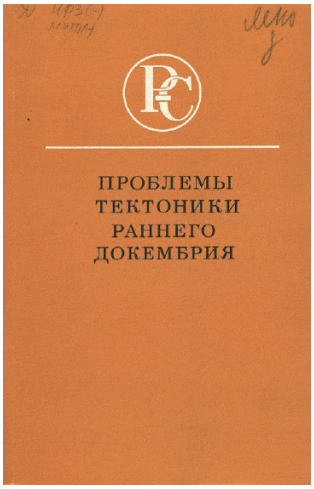
Nikolay Yuryevich Groshev – "The Two-Phase Platinum-Bearing Fedorova Tundra Massif (Kola Peninsula): Geology and Types of Low-Sulfide PGE Mineralization", 2010, Candidate of Geological and Mineralogical Sciences.

Lyudmila Nikolaevna Morozova – "Geology, Geochemistry, and Age of Granitoids of the Voche-Lambina Area: Kola Peninsula", 2012, Candidate of Geological and Mineralogical Sciences.

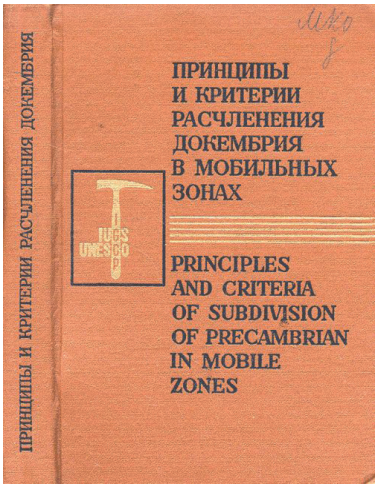
SELECTED MONOGRAPHS



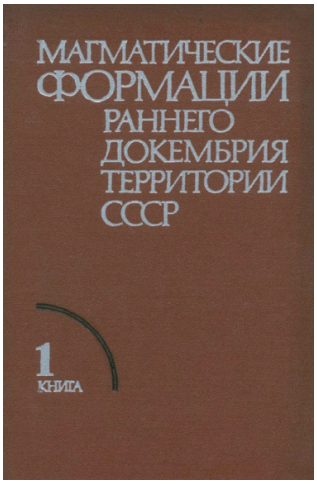




From left to right: Early Precambrian Granitoid Formations. Institute of Geology and Geochronology of the Precambrian, Academy of Sciences of the USSR. Leningrad: Nauka, 1975. – 292 p. Co-author: **F. P. Mitrofanov**.
General Issues of the Stratification of the Precambrian of the USSR. Leningrad: Nauka, 1979. – 164 p. Editor: **F. P. Mitrofanov**.
Problems of Early Precambrian Tectonics. Leningrad: Nauka, 1980. – 208 p. Executive Editor: **F. P. Mitrofanov**.



Principles and criteria of subdivision of Precambrian in mobile zones. 1980. – 312 p. Editor: **F. P. Mitrofanov.**



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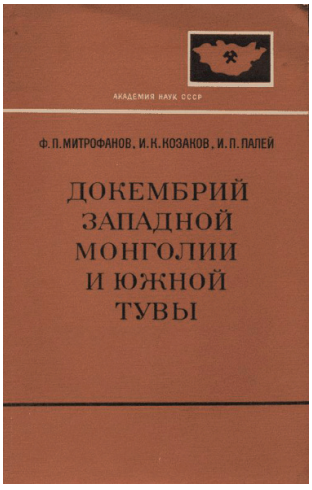

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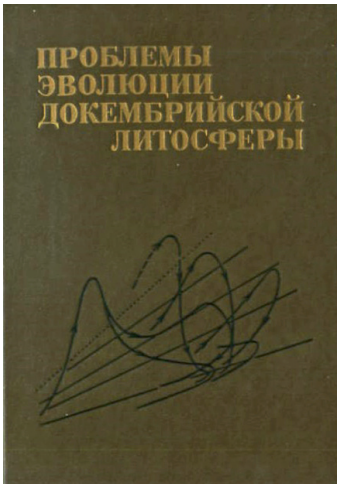
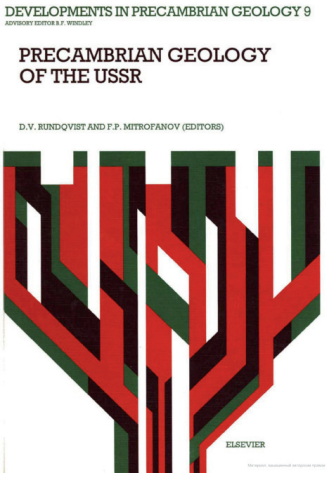
Mitrofanov, F. P., Kozakov, I. K., Paley, I. P. Precambrian of Western Mongolia and Southern Tuva. Joint Soviet-Mongolian Scientific Geological Expedition. Proceedings, Vol. 32. Leningrad: Nauka, 1981. – 156 p.

The Oldest Rocks of the USSR. Editors: **F. P. Mitrofanov**, M. D. Krylova. Leningrad: Nauka, 1984. – 90 p.





From left to right:

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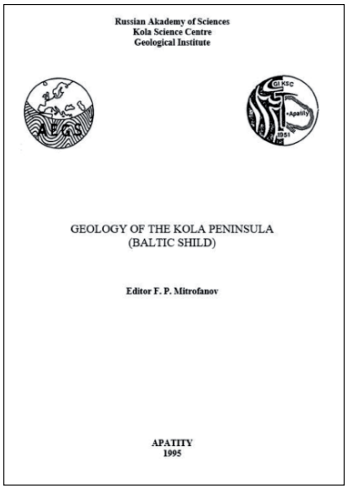
Precambrian Geology of the USSR. Vol. 9. Elsevier, 1993. Editors: D. V. Rundkvist and **F. P. Mitrofanov**



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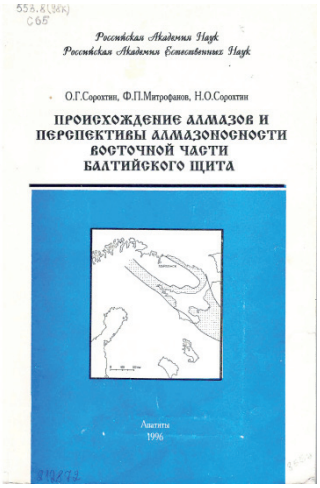

O. G. Sorokhtin, **F. P. Mitrofanov**, N. O. Sorokhtin, The Origin of Diamonds and the Prospects for Diamond Potential in the Eastern Part of the Baltic Shield. 1996. 145 pp.

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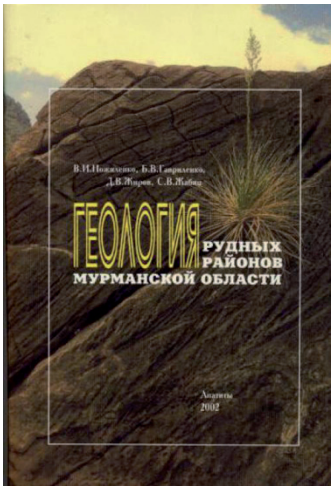
The Kola Superdeep Borehole: Scientific Results and Research Experience. Moscow: MF Tekhoneftegaz Publishers, 1998a. 260 pp. **F. P. Mitrofanov** – member of the editorial board and co-author of the chapters "Main Geological Features of the Northeastern Baltic Shield" and "U-Pb Geochronology of the Archean Section of the Kola Superdeep Borehole."



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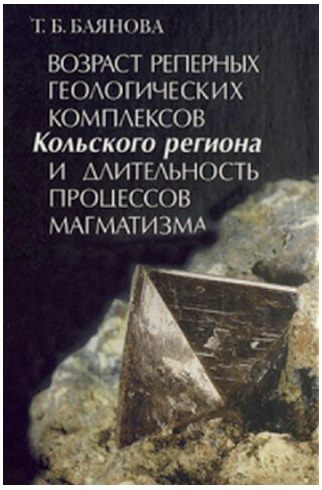

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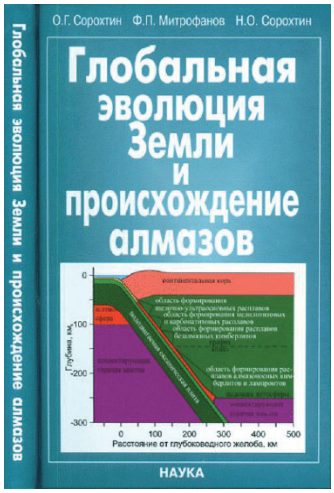

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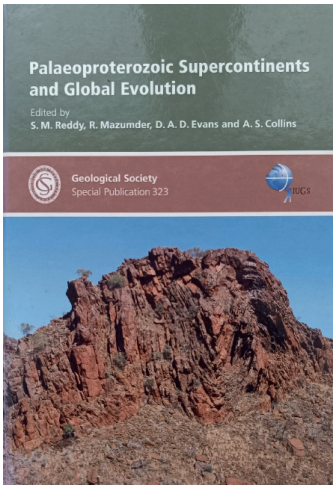
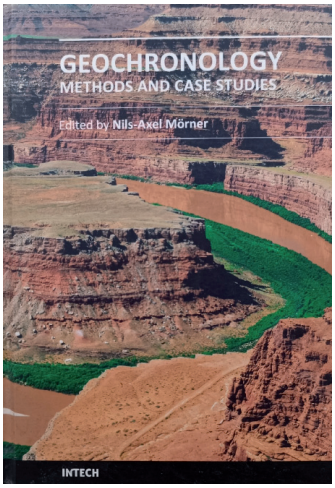
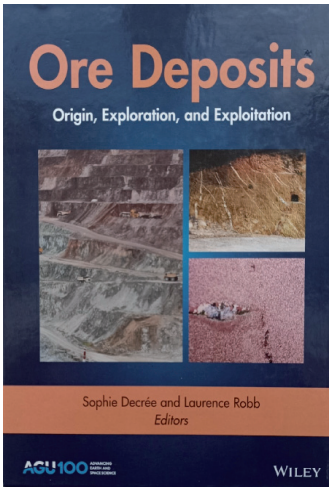


Palaeoproterozoic Supercontinents and Global Evolution / Eds. S. M. Reddy, R. Mazumder, D.A.D. Evans, A. S. Collins. Geological Society. Special Publications. 2009. V. 323. 362 p. **F. P. Mitrofanov** – co-author of article "Timing and duration of Palaeoproterozoic events producing ore-bearing layered intrusions of the Baltic Shield: metallogenic, petrological and geodynamic implications"



Geochronology – Methods and Case Studies / Edited by Nils-Axel Mörner // INTECH, 2014, 193 p. **F. P. Mitrofanov** – co-author of article "Layered PGE Palaeoproterozoic (LIP) intrusions in the N-E part of the Fennoscandian Shield – isotope Nd-Sr and $^{3}He/^{4}He$ data, summarizing U-Pb ages (on baddeleyite and zircon), Sm-Nd data (on rock-forming and sulphide minerals), duration and mineralization"



Ore Deposits: Origin, Exploration, and Exploitation / Edited by Sophie Decree and Laurence Robb // Geophysical Monograph Series. Wiley. 2019. 260 p. **F. P. Mitrofanov** – co-author of section "Features of atypical types of mineral deposits и статьи Origin and exploration of the Kola Province rich in polymetallic ores: new geochronological data"

F. P. Mitrofanov et al. Kola PGE-bearing Province. Apatity: FRC KSC RAS, 2023. 193 p.

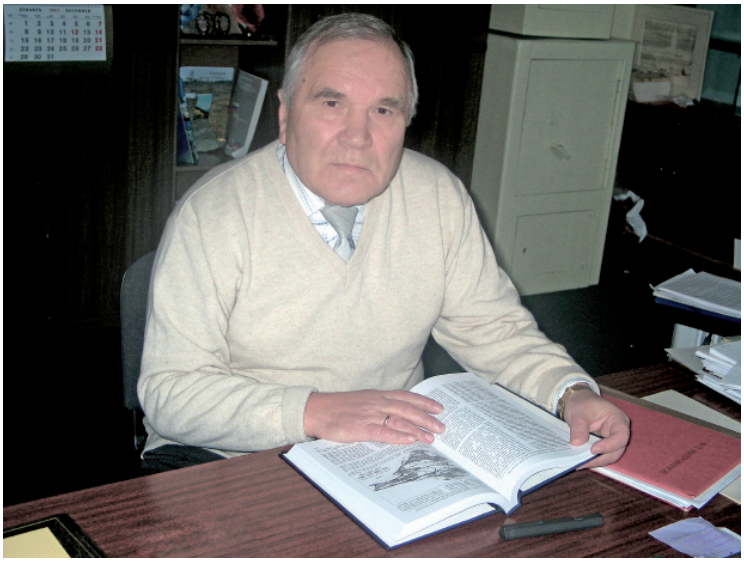
SCHIENTIFIC ACHIEVEMENTS

Academician F. P. Mitrofanov theoretically justified, and subsequently confirmed through extensive exploratory studies, the presence of platinum-group metal ores in the Fedorovo-Pansky Massif, comparable to the Bushveld ores in South Africa.

The implementation of new forms of cooperation between science and industry allowed the geological team under F. P. Mitrofanov's scientific leadership to complete exploration work at two major PGE-bearing deposits (Fedorova Tundra and Kievey), secure their reserves in the State Balance of the Russian Federation in 2008, and allocate approximately 410 t of platinum-group metals and gold to the state balance. He demonstrated that with further exploration at the Kievey deposit down to a depth of 500 m, the reserves of platinum-group metals and gold could potentially increase sixfold.

The most significant result of F. P. Mitrofanov and his colleagues' work is the first identification and characterization in Europe of a unique, large-scale East Scandinavian PGE-bearing Province. It covers an area of over 200,000 km² across the Kola Peninsula, Karelia, and eastern Finland.

Based on comprehensive geological, mineralogical, isotopic, and other studies, F. P. Mitrofanov and his team identified geological, petrological, and isotopic exploration indicators that allow reliable assessment of the metallogenic potential – and thus the prospectivity – of ore bodies without conducting large-scale, costly drilling and extensive geochemical sampling at early stages. The new exploration framework he established is now actively used by several mining enterprises..



AWARDS AND CERTIFICATES OF HONOUR OF ACADEMICIAN F. P. MITROFANOV


Medal “For Distinguished Labour” – 13 May 1981, No. 597447 (left); Order of Friendship – 11 October 1995, No. 0767 (centre); Order of Honour – 17 May 2006, No. 14299 (right)

Badge “Honored Geologist of the Russian Federation” No. 239583, 22 June 2011 (left); Honorary Badge of the Russian Academy of Natural Sciences “Knight of Science and Art” (centre); Badge of Laureate of the State Prize of the Russian Federation No. 0083, 5 June 2012 (right)

МЕЖДУНАРОДНАЯ АКАДЕМИЯ НАУК
Экологии, Безопасности человека и природы
(МАНЭБ)

На основании Устава Академии

Митрофанов
Феликс Петрович

избран(а)

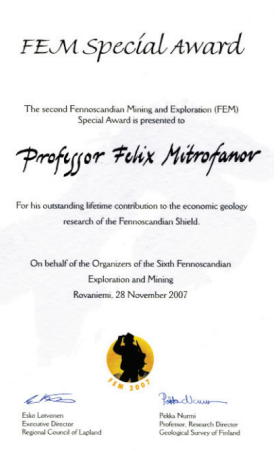
ПОЧЕТНЫМ АКАДЕМИКОМ

по секции *Горно-металлургическая*

Президент В.Рогалев

Ученый секретарь Рег. № *D-840*

Санкт-Петербург "*02*" *июня* *2005*



FEM Special Award

The second Fennoscandian Mining and Exploration (FEM) Special Award is presented to

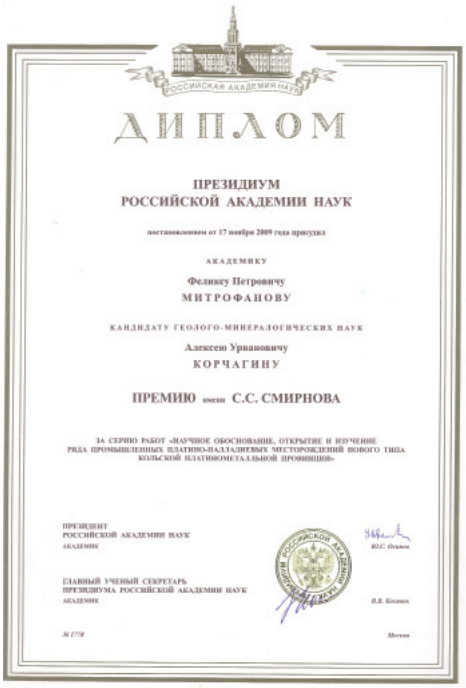
Professor Felix Mitrofanov

For his outstanding lifetime contribution to the economic geology research of the Fennoscandian Shield.

On behalf of the Organizers of the Sixth Fennoscandian Exploration and Mining
Rovaniemi, 28 November 2007

Eiko Latvonen
Executive Director
Regional Council of Lapland

Pekka Nurmi
Professor, Research Director
Geological Survey of Finland



РОССИЙСКАЯ АКАДЕМИЯ НАУК

ДИПЛОМ

ПРЕЗИДИУМ
РОССИЙСКОЙ АКАДЕМИИ НАУК

постановлением от 17 ноября 2009 года присудил

АКАДЕМИКУ

Феликсу Петровичу
МИТРОФАНОВУ

КАНДИДАТУ ГЕОЛОГО-МИНЕРАЛОГИЧЕСКИХ НАУК

Алексею Урвановичу
КОРЧАГИНУ

ПРЕМИЮ имени **С.С. СМИРНОВА**

ЗА СЕРИЮ РАБОТ «НАУЧНОЕ ОБОСНОВАНИЕ, ОТКРЫТИЕ И ИЗУЧЕНИЕ РЯДА ПРОМЫШЛЕННЫХ ПЛАТИНО-ПАЛЛАДИЕВЫХ МЕСТОРОЖДЕНИЙ НОВОГО ТИПА КОЛЬСКОЙ ПЛАТИНОМЕТАЛЛЬНОЙ ПРОВИНЦИИ»

ПРЕЗИДЕНТ РОССИЙСКОЙ АКАДЕМИИ НАУК
АКАДЕМИК Ю.С. Осипов

ГЛАВНЫЙ УЧЕНЫЙ СЕКРЕТАРЬ ПРЕЗИДИУМА РОССИЙСКОЙ АКАДЕМИИ НАУК
АКАДЕМИК В.Е. Хаин

№ 1770 Москва

РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ
НА ИЗОБРЕТЕНИЕ
№ 2506613

СПОСОБ ОПРЕДЕЛЕНИЯ ПЛАТИНО-ПАЛЛАДИЕВОЙ И МЕДНО-НИКЕЛЕВОЙ МЕТАЛЛОГЕНИЧЕСКОЙ СПЕЦИАЛИЗАЦИИ БАЗИТ-ГИПЕРБАЗИТОВОГО РАССЛОЕННОГО МАССИВА АРХЕЙСКОГО КРИСТАЛЛИЧЕСКОГО ЩИТА

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Б.П. Симонов

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Указ Президента Российской Федерации
от 05 июня 2012 г.
№764

Митрофанову
Феликсу Петровичу

присуждена Государственная премия Российской Федерации в области науки и технологий 2011 года и вручен почетный знак лауреата Государственной премии Российской Федерации № 0083

Президент Российской Федерации
М.П.

Presentation of the special FEM “Golden Hammer” award to F. P. Mitrofanov for his outstanding contribution to research in the economic geology of the Fennoscandian Shield. Rovaniemi, 2007

Moscow, Kremlin, 12 June 2012.
Laureates of the State Prize of the Russian Federation

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Popular Science Edition

Tamara Borisovna **Bayanova**,
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**ACADEMICIAN FELIX PETROVICH MITROFANOV —
KNIGHT OF THE SCIENCE**

Dedicated to the 90th Anniversary of Birth

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