

MEMORIALS



Irina Vladislavovna Bussen
(24.09.1915 – 20.02.2013)

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On the 20th of February 2013, Irina Vladislavovna Bussen, the eldest Russian mineralogist, geologist, petrologist and a remarkable specialist in alkaline massifs, left us. She was one of the last geologists from the Pleiades of brilliant specialists who explored famous loparite deposits of Lovozero before and after the World War II. They laid the foundation of the tantalum-niobium industry in the USSR. Irina Vladislavovna lived long, very fruitful, interesting, and not easy life. She actively and effectively worked in academic and prospecting geology during the most complicated periods of the Soviet State. During her last years, she did not lose an interest to her favorite work and the world around.

Irina V. Bussen was born on the 24th of September 1915 in Petrograd (St. Petersburg now), in noble family. In 1933, she graduated from the Leningrad Geological Exploration College and then continued her study at the geology-pedology-geographical department of the Leningrad University. She was interested in many geological disciplines, with main focus on mineralogy. After the second year in the university, the nineteen year old student participated in the mapping survey on the southern slopes of the Lovozero Tundras under the guidance of geologist Alexey Sergeevich Sakharov, spending her last month of that season at the Ninchurt site to assist the senior student Olga Mikhailovna Rimskaya-Korsakova. These events influenced all her future life. Over time, Alexey Sergeevich became her husband, whereas Olga Mikhailovna, future famous mineralogist and lecturer of Mineralogical Department of Leningrad State University, became her close friend. The Lovozero Massif occupied the main place in her professional career.

From 1935 until 1937, I.V. Bussen actively studied Lovozero, primarily as a geologist, doing the mapping survey works, and also as mineralogist and crystallographer, studying loparite. She wrote: *“I completed my annual student’s report on loparite, including study of its goniometry and polished sections, and showed that it varied in different rocks. Just give me a small loparite crystal and I will tell you from which rock it was collected. Nobody did it before”*. In 1938, Irina Vladislavovna graduated from the university and went to Yakutia. Immediately before the Great Patriotic War (World War II in the USSR) and in war time, I.V. Bussen explored the geology of the Polar Urals for quartz deposits, needed by the country, and contributed to the understanding of metamorphic stratigraphy in the region. She compiled geological maps and studied genesis of bergcrystal-bearing veins.

Soon after the war, A.S. Sakharov, the military officer, who just returned from Germany, and I.V. Bussen were invited to work in the Kola Peninsula. The main task was exploration and preparation for exploitation of the Lovozero loparite deposits. From 1946 until 1949, the spouses lived in the Lovozero village and worked for the Lovozero Complex Geological Exploration Expedition. In 1949, A.S. Sakharov and I.V. Bussen returned to Leningrad, where they continued to work with Lovozero materials. In 1950, Irina Vladislavovna studied the Vishnevye Gory rare-element deposit in the South Urals as a main project.

In 1954, I.V. Bussen and A.S. Sakharov accepted the invitation from the Geological Institute of the Kola Branch of the USSR Academy of Sciences, and moved to work in the Kukisvumchorr town in Khibiny, and then to Apatity. As Irina Vladislavovna recalled, she and Alexey Sergeyevich have finally fulfilled their old dream to devote all their efforts to science. The Lovozero Massif continued to be the main project for research. A.S. Sakharov worked mainly on its geology – “*an anatomy of the intrusion*”, as he said – and on problems of its genesis and stratification, whereas I.V. Bussen focused on mineralogy and petrology of Lovozero. But she was one of the last universal geologists, who were equally brilliant in methodology of the practically whole spectrum of geological sciences, ranging from fine mineralogy and petrology to structural geology, tectonics, geomorphology, and geology of Quaternary deposits.

Irina Vladislavovna used to say: “*Yes, I worked in many areas of science. Here I have articles about clay, about normal faults, and, for example, about relief. Nowadays, narrow specialization became more popular: if you are not a geomorphologist, you do not look at geomorphology, whereas geomorphologists do not know geology, and they draw up just a “dead” relief. I was drawing up a “live” relief, detecting the rock by the slope type. By the stone color, I could identify the gneiss. On the gneisses, greenish-blue lichens have developed, but on the alkaline rocks, only black lichens could have grown.*” She remembered with a great respect famous Wilhelm Ramsay, the first explorer of the Kola alkaline massifs: “*...still Ramsay was a genius! It is unbelievable how he could know all this, how he could so successfully do at the same time mineralogy, topography, and ethnography! Already then, he proposed that Lovozero and Khibiny were the central-type intrusions. Amazing people lived at that time...*” The characteristic features identified by I.V. Bussen, linking geomorphology, types of rocks, and plants typical for them, formed the basis for practical methods, successfully used today for the study of the alkaline massifs.

In 1961, I.V. Bussen completed her PhD thesis and became a leader of the mineralogical group in the institute. During the 1950-60s, her group achieved a lot. The two monographs are their main results of the Lovozero research: I.V. Bussen & A.S. Sakharov, *Geology of the Lovozero Tundras*, Leningrad, Nauka, 1967, 125 pp.; and I.V. Bussen & A.S. Sakharov, *Petrology of the Lovozero Alkaline Massif*, Leningrad, Nauka, 1972, 296 pp. Both books became classic and are famous not only due to magnificent factography and interpretation of the facts, but also owing to a unique complex approach that was systematically developed by the authors. Many generations of geologists exploring the alkaline massifs will learn from these works.

In 1970, a pegmatite lode of completely new type, named Yubileinaya, was discovered at the Karnasurt underground mine in Lovozero. Today, this relatively small pegmatite is famous worldwide. Its specimens are represented in every mineralogical museum, though then Yubileinaya was just a collection of puzzles. Several research groups, including, first of all, I.V. Bussen and her group, immediately started the studies of unusual minerals discovered here. Irina Vladislavovna was interested in mineralogy, as well as in geochemistry and genesis of this pegmatite. Together with colleagues, she was first to complexly characterize specific branch of high-alkaline formations, such as hyperagpaitic rocks and pegmatites. Later, this topic was fully scientifically explored in the works of A.P. Khomyakov, but foundations were established in two general articles of I.V. Bussen with co-authors, published in 1975 and 1978.

During short four years, Irina Vladislavovna with co-authors published descriptions of eight new minerals found in hyperagpaitic pegmatite at the Karnasurt Mine,

including six of them discovered at Yubileinaya: ilmajokite (1972), zorite, raite, vuonnemite (1973), penkvilksite (1974), bornemanite, natrosilite, and natisite (1975). In 2001, mineral busenite, $\text{Na}_2\text{Ba}_2\text{Fe}^{2+}\text{TiSi}_2\text{O}_7(\text{CO}_3)(\text{OH})_3\text{F}$, was named to honor the researcher herself. This mineral, collected at the adjacent Khibiny Alkaline Massif, was described by A.P. Khomyakov and Yu.P. Men'shikov. Busenite is the only layered titanosilicate with carbonate groups.

In 1972, due to her private circumstances, I.V. Bussen left her work in Apatity and returned to Leningrad where she continued to study minerals and publish her results. In total, in addition to two monographs, she published more than 50 scientific articles since the 1950s until the early 1980s.

I became acquainted with Irina Vladislavovna in 1998, during preparation of my book about history of studies and mineralogy of the Lovozero Massif. Having long being retired, she was as usual interested in every new event in the study of her favorite Lovozero and proudly named it "*Our Massif*". Irina Vladislavovna perfectly remembered all the numerous events in the history of research and exploration of the Lovozero Tundras, and it was impossible to find a better source of data on the subject. I communicated with Irina Vladislavovna on many occasions; we phoned each other and exchanged letters until the beginning of this year. When my book about Lovozero was released, the most important rating for me was congratulation from Irina Vladislavovna. During our discussions, I asked her opinion on very diverse, not only professional, subjects and invariably discovered a lot of interesting things. I could not stop to admire the cheerfulness and fortitude of Irina Vladislavovna, as well as clarity of conclusions and statements as well as her elegant humor.

Irina Vladislavovna Bussen, a remarkable person from remarkable generation, has left us. But she always will stay in our memory, same as her name will stay in history of Russian geology and mineralogy.

Igor V. Pekov

Yury Pavlovich Men'shikov (28.12.1934 – 21.03.2013)

Yury Pavlovich Men'shikov was born on the 28th of December 1934 in the Sayda-Guba Settlement in Murmansk Oblast, in severe region of granite rocks, covered with lichen, and eternally stormy Barents Sea, with stunted birch-trees in the valleys, somehow hidden from biting north winds. In 1936, the family moved to the Polyarnyi Town, where a base of the Northern Navy Fleet was located. Pavel Alexandrovich Men'shikov, the father of Yury Pavlovich, served at the fleet bakery. From the beginning of World War II, the military base and town were under permanent attacks of the German aviation. Yury with his mother and two youngest sisters was evacuated to the Kuibyshev Oblast, Volga Region, but immediately after liberation of Zapolyarie in 1944, the family returned to their father to start the peaceful life.

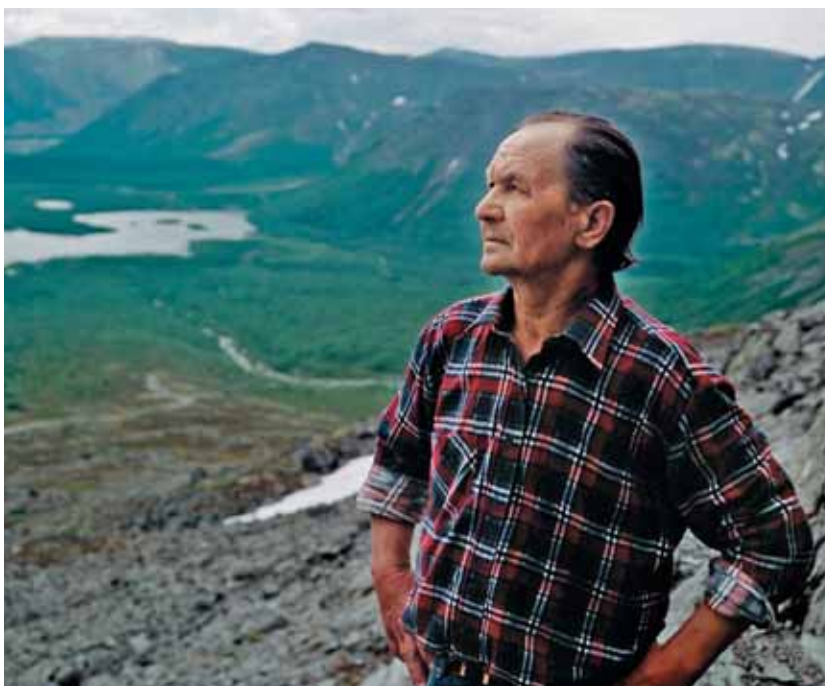
In 1946, the Men'shikovs moved to Rybnitsa in Moldavian SSR, where Yury graduated from the seven-year school in 1951. Geography was a favorite of Yury's subjects. He especially remembered geological trips near Rybnitsa. Immediately after school, Yury Pavlovich returned to the Kola land and went to the Kirovsk Mining-Chemical College to study exploration drilling. Here, he met a remarkable educa-

tor Liliya Alexandrovna Perekrest, who taught mineralogy to many generations of miners. At present, her name is immortalized in the name of perliolite, a mineral discovered by Yury Pavlovich in the Khibiny Mountains. Successfully completing his education in 1954, the young technician went to work with a meliorative team exploring year-round for drinking water in Estonia. After a mere six months, the dank Baltic weather, constant dampness and poor living conditions so undermined the health of the young explorer, that the only solution was his moving to the “health resort” of seasonal works at Mangyshlak in Kazakhstan. Equally nightmare conditions of saline desert became an infamous reason, which made Yury completely healthy by the time of his conscription to military service.

After his military service, Yury visited his parents, but did not want to live in Moldavia. He returned to homely Polar Kirovsk. The dreams of young geologist about immediate participation in the geological expeditions, discovery of new deposits or even about scientific research at the Fersman’s “*Tietta*” crushed into severe reality: it was necessary not to search for the new deposits but to explore the already known ones. In this way, Yury Pavlovich was sent to a tunnel squad, conducting the Materialnaya adit at the Yukspor apatite deposit. At present, this adit is well-known for mineral abundance of numerous pegmatites. At this time, Yury’s interest in mineral studies, which was apparent even in the school and college, has evolved into his lifework.

Upon the order of the Academician A.V. Sidorenko, the head of the Kola Branch of the USSR Academy of Sciences, Yury Pavlovich was included into the Khibiny field team headed by A.V. Galakhov. After the end of the 1958 field season, he joined the staff of the institute. From then until his last days, life of Yury Pavlovich was connected with the Khibiny Massif and with Geological Institute of the Kola Science Center of the Russian Academy of Sciences.

Being in a group of powder X-ray diffraction analysis, Yury Pavlovich was supervised by A.P. Denisov, a remarkable scientist whom Yu.P. Men’shikov considered as



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his teacher and always remembered with great warmth. One of his first discovered minerals was named denisovite. Yury Pavlovich quickly and perfectly mastered the methods of X-ray diffraction determination of minerals, creating and constantly filling the card-file of standard X-ray films. He became an indispensable specialist. The leading mineralogists of the country willingly carried out their investigations of unknown minerals with him.

Scientific discussions continued even in the hostel of the Kola Science Center that recently moved from Kirovsk to Apatity, rapidly absorbing young specialists from the whole country. They concerned different geological disciplines, mining and chemistry. Thus, the scientific links were developed and “scientific families” started. Here, Yury Pavlovich met his future wife Natalia Andreevna Zvereva. She worked as an analytical chemist in the recently formed Institute of Chemistry and Technology of Rare Elements and Raw Materials. They lived together for 52 years and brought up three sons.

In 1971, Yury Pavlovich graduated from the Perm’ State University. Already in 1975, Yu.P. Men’shikov identified in Khibiny the widespread xenoliths of hornfels and fenitized volcanic-sedimentary rocks with corundum and rare-element mineralization. He provided recommendations on mining of gem sapphire. In 1985–90, he first recognized the areal distribution of kalsilite rocks in the Khibiny and developed the technique of its quantitative powder X-ray diffraction analysis in the rocks. During these years, a new type of rare metal (loparite) mineralization was identified in the Khibiny with his active contribution. Unfortunately, as it often happens with talented scientists, brainchildren of Yu.P. Men’shikov quite seldom met understanding of his academic chiefs, and many of his discoveries and finds were made ‘underground’ or even in opposition. Later, these materials formed the basis of several PhD and doctoral dissertations.

Yury Pavlovich Men’shikov is one of the leaders of Russian mineralogy. Fifty new minerals were discovered by him or with his direct participation: alumotantite, armbrusterite, ancylite-(La), belovite-(La), bornemanite, bussenite, bykovaite, vozhhminite, vuonnemite, vyuntspakhkite-(Y), denisovite, eliseevite, ershovite, zorite, inaglyite, kolfanite, komkovite, konderite, krivovichevite, cuproiridsite, cuprorhodsitite, lovdarite, nabaphite, natisite, natrosilite, natrotantite, nechelyustovite, oulankaite, padmaite, penkvilksite, perliialite, punkaruavite, raite, sitinakite, sorosite, sosedkoite, tatyanaite, ternovite, ferronickelplatinum, fluorcalciobrihtolite, hingganite-(Yb), chlorbartonite, cesstibtantite, cerite-(La), chivruaiite, shkatulkalite, shomiokite-(Y), eveslogite, edgarite, and yakovenchukite-(Y). His discovery of a series of microporous titanosilicates, in particular, zorite, chivruaiite and sitinakite, resulted in development of the entire industry of modern materials and creation of unique synthetic sorbents, used in different chemical and radiochemical technologies. In 2002, the International Mineralogical Association approved a new mineral menshikovite, the arsenide of palladium and nickel, named in honor of Yury Pavlovich for his outstanding contribution to mineralogy.

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