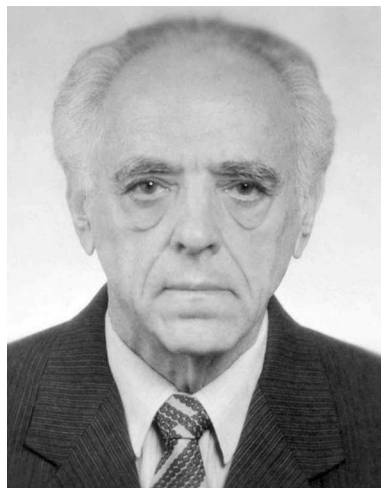


Mikhail Iosifovich Kadets (obituary)

On 7 March 2011 Mikhail Iosifovich Kadets passed away.

He was born in Kiev on 30 November 1923. After graduating from school and serving in the army, he enrolled in 1946 in the Faculty of Physics and Mathematics at Kharkov State University. While still a student, Kadets became interested in Banach space theory. In 1948 Banach's famous monograph "[Théorie des opérations linéaires](#)" (1932) was published in Ukrainian. Kadets studied this book deeply and was fascinated by many of the problems formulated there. This monograph became his reference book, and the problems stated by Banach remained the subject of Kadets' interests for the rest of his life.



After graduating from the university Kadets moved from Kharkov to Makeevka in Donetsk Province, where he worked for seven years in the Research Institute of the Coal Mining Ministry and taught mathematics and physics at a fire-fighting technical school. He was never a postgraduate student and had no scientific advisor in the standard sense of the word.

In Makeevka he obtained his first interesting research results, and in 1955 in Kharkov he defended his Ph.D. dissertation written on the basis of those results. In 1957 he returned to Kharkov and from that time taught there in various technology institutes of higher education. In 1963 he defended his D.Sc. dissertation. His publications from that period were concerned with two areas: a topological classification of Banach spaces, and vector series. Numerous problems which arose there became the topics of his subsequent investigations.

After 12 years of intense work in the first area, Kadets solved in the affirmative the longstanding Fréchet–Banach problem of homeomorphism of all separable infinite-dimensional Banach spaces. This remarkable result immediately became classical.

One of his tools in the solution of this problem was the construction of equivalent norms satisfying some special convexity conditions. It then turned out that the technique of equivalent norms was effective in a much broader range of problems in the geometry of Banach spaces and non-linear analysis. Kadets is justly regarded as

one of the creators of the theory of equivalent renormings of Banach spaces, which has now grown into a separate area.

His main results in the theory of series relate to infinite-dimensional analogues of Steinitz' famous theorem on rearrangements. The latter is a finite-dimensional analogue of Riemann's classical theorem on conditionally convergent numerical series. For series in L_p Kadets found sufficient conditions on the rate of decrease of the terms of the series ensuring that the set of sums of its convergent rearrangements is a translation of some subspace. Later on, E. M. Nikishin and P. A. Kornilov showed that these conditions are also necessary. But without any additional conditions the set of sums can have a quite different structure. In a joint paper Kadets and K. Woźniakowski proved (1989) that in any infinite-dimensional Banach space there is a series such that the set of sums of its convergent rearrangements consists of two points.

Of great importance for the development of the theory of series in Banach spaces was the book "[Series in Banach spaces: conditional and unconditional convergence](#)" (Birkhäuser, 1997) written by M. I. Kadets together with V. M. Kadets.

More than 60 years have now passed since the publication of the Ukrainian translation of Banach's book. The appearance of Banach space theory has changed significantly since then, in many respects thanks to Kadets' results. Almost all of them were subsequently developed further in one way or another, and some of them underlie whole areas of modern Banach space theory. Here are several examples.

His result that a separable Banach space has an equivalent Fréchet-differentiable norm if and only if the dual space is separable, became one of the basic results of the theory of smooth renormings (see the monograph by [R. Deville, G. Godefroy, and V. Zizler, *Smoothness and renormings in Banach spaces*, Wiley, 1993](#)).

The Kadets–Snobar estimate for the projection constant of an n -dimensional normed space and the Gurarii–Kadets–Macaev (Matsaev) estimate of the Banach–Masur distance between the n -dimensional l_{p_1} and l_{p_2} spaces are significant contributions to the theory of finite-dimensional spaces (see N. Tomczak-Jaegermann's monograph: [Banach–Mazur distances and finite-dimensional operator ideals](#), Wiley, 1989).

The Kadets–Kürsten theorem that a vector-valued function which is almost periodic on each linear functional must have a countable spectrum and the theorem of Kadets on the maximal class of Banach spaces in which the Bohl–Bohr theorem on the integral of an almost periodic function holds are central results in the theory of vector-valued almost periodic functions.

The fundamental results due to Kadets and A. Pelszyński on the linear topological structure of the L_p -spaces have numerous applications not only in Banach space theory but also in the theory of functions.

Kadets' theorem that there exists a separable Banach space E such that each separable Banach space with the bounded approximation property is isomorphic to a complemented subspace of E is one of the central results in the theory of universal Banach spaces.

His 1/4 theorem solved the famous Paley–Wiener problem on the basis property for systems of exponentials in L_2 .

Kadets devoted much time and effort to his pedagogical activities. Nineteen of his students defended their Ph.D. dissertations and among them seven became doctors of the sciences. He was generous in sharing his mathematical ideas with his students. His Kharkov school was well known internationally. In particular, A. Pietsch mentions it as a phenomenon in Banach space theory in his book “[History of Banach spaces and linear operators](#)” (Birkhäuser, 2007).

In 1991 Kadets was given the title of Honoured Scientist of Ukraine, and in 2005 he was awarded a State Prize of Ukraine.

Mikhail Iosifovich Kadets was a brilliant and an exceptionally deep mathematician, a kind and sympathetic person, witty and pleasant to talk with. That is how he will remain in our thoughts.

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