Geometric school

The founder of Kazan Geometric School is an ingenious creator of non-Euclidean geometry Nikolai Ivanovich Lobachevski (1792-1856).

N.I. Lobachevski solved the problem of the Euclid's axiom about parallel lines, which for almost two thousand years had been the subject of a constant work for geometricians all over the world, stating that this axiom is not derived from other basic concepts of geometry.

In his research, Lobachevski proved that the axiom gradually comprised nearly all branches of mathematics. His discovery broke the dogmatic understanding of Euclidean system, being the only possible one, and led to the origin of numerous and various non- Euclidean geometries.

This contributed to the expansion of possible application of geometry to the other branches of mathematics and physics, which prepared the ground for the revolution in contemporary natural science. General acceptance of Lobachevski's ideas in the late 60s of the 19th century attracted mathematicians to the questions of fundamental geometry and, in particular, to the remarkable memoir of B. Riman "A concise outline of the foundations of geometry", in which he covered the question of non-Euclidean geometry from differential-geometric point of view.

One of the first geometers, who laid the foundation for creative development of Riman`s ideas, was F.M. Suvorov. In his work "On the characterization of three-dimensional systems" he finds the whole system of differential invariants of the second order, marking its connection with Lobachevski space.

A.V.Vasilyev, heading in 1884-1907 physic-mathematical association of Kazan State University, took significant measures to expand Lobachevski's ideas, created the first scientific biography of the great geometer as well as erecting the monument, and contributed to the founding of Lobachevski International Prize. The following students of A.V.Vasilyev worked at the university: A.P. Kotelnikov, D.M. Sintsov, I.N. Parfentyev, and E.I.Grigoryev.

A.P. Kotelnikov found the connection of Lobachevski's geometry with projective geometry, mechanics, theory complex numbers vectors.

D.N. Zeiliger used Kotelnikov`s findings to solve some questions of ruled geometry.

By dedicating his first works to Lobachevskian geometry, P.A. Shirokov was the first in USSR who studied Riemannian space using methods of tensor

analysis. In the meantime, he paid special attention to studying spaces, especially the geometry similar to Lobachevski space.

Kogan-Shura-Shirokov spaces (A-spaces) and special classes of Cartan symmetric spaces have a significant meaning for algebra. P.A. Shirokov brought up a large number of scientists, among them are B.L. Laptev, I.P. Egorov, A.Z. Petrov, and P.I. Petrov.

When moved from Moscow to Kazan in 1945, A.P. Norden continued developing his normalizing method by distributing it to multidimensional spaces, applying it to geometries of subgroups of projective group, to ruled and conformed geometries, and to the network theory. A part of Norden`s works is dedicated to applying the geometry of biaxial and biaffine spaces to the questions of theory of functions of a complex variable, to studying ruled geometry, bitensors of Lorentz space, special types of Riemannian spaces and affinely connected space. The following DScs were brought up by A.P. Norden: V.I. Vedernikov, R.G. Bucharaev, A.P. Shirokov, V.I. Shulikovsky, V.V. Vishnevsky.

A.Z. Petrov studied application of geometric methods to the research, and especially to the field of theoretical physics. He submitted the classification of four-dimensional space of Einstein, Lorentz signature, and also the classification of gravity field of standard form in accordance with algebraic structure of space-and-time curvature tensor.

B.L. Laptev created general theory of spaces of supporting elements. Having profoundly developed Lie differentiation device in these spaces, he applied it to solving of variational problems, finding groups of automorphisms in differential-geometric structures. B.L. Laptev dedicated the significant part of his research studying the bio and legacy of N.I. Lobachevski, the history of mathematics in Kazan State University.

Different aspects of the theory of spaces in algebra, their numerous applications to the ruled geometry, geometry of non-Euclidean spaces, theory of tangent fibration of both the first and higher orders have been developing in the works of A.P. Shirokov and his followers.

V.I. Shulikovsky made a significant contribution to the development of network theory. V.V. Vishnevsky conducted research of spaces with affinory structures of standard forms in their close connection with the algebra of plural numbers, studied semitangent bundles, which model manifolds with affinory structure of standard forms.

B.N. Shapukov developed general theory of linear connections and Lie differentiation on complete spaces of smooth bundles, investigated some structures, appearing naturally on foliated manifolds.

V.V. Shurygin carried out research on geometry and topology of bundles of A-streams of A.Weil as manifolds of algebra. In the terms of cohomology theory, he built barriers (classes of Atiyah-Molino) for existence of some differential-geometric structures on outlined bundles.

In the works of A.V. Aminova and V.R. Kaigorodov invariant-group method to the construction of geometric theory and group approach to the construction of geometric theory of differential equation are developed.