Viktor Stepanovich Kulikov (on his 60th birthday)

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MATHEMATICAL LIFE

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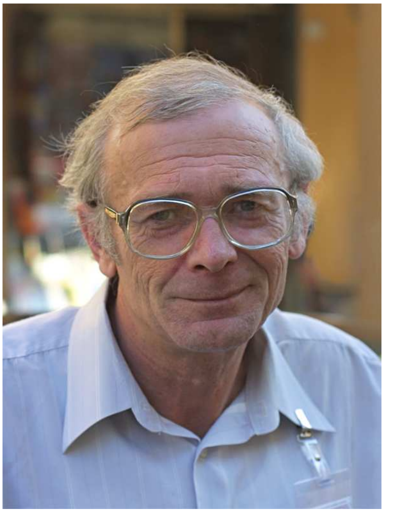

Doctor of the Physical and Mathematical Sciences Viktor Stepanovich Kulikov of the Department of Algebra and Number Theory at the Steklov Mathematical Institute of the Academy of Sciences, a very original mathematician and one of the most prominent representatives of the Moscow school of algebraic geometry, turned 60 on 13 April 2012. He began his mathematical career brilliantly by proving in his Ph.D. thesis that the period map for surfaces of $K3$ type is an epimorphism. This result was perceived as a real sensation in the whole mathematical community, and in Moscow a seminar was organized devoted to the study of his proof. Such a brilliant beginning in research also compelled Kulikov subsequently to take on only very clearly stated and well-known problems, which he has been solving in classical 'Steklov' style.

In 1969 Kulikov enrolled in the Faculty of Mechanics and Mathematics at Moscow State University, and upon graduating he was immediately admitted to Ph.D. studies at the Steklov Institute, where I. R. Shafarevich was his adviser. He began studying degenerations of surfaces of $K3$ type, at that time a very new subject about which there were few results. In his Ph.D. thesis Kulikov constructed minimal models of all semistable degenerations of surfaces of $K3$ type. The main difficulty in this problem was that the relative three-dimensional theory of minimal models of one-dimensional families of surfaces had not even been initiated at that time! Nevertheless, he was able to solve the problem brilliantly, introducing at the same time a notion of birational surgery corresponding to the modern birational surgeries of minimal models, and thus anticipating the minimal model programme. Moreover, his result covers all possible degenerations of surfaces of $K3$ type, by Mumford's theorem on semistable reduction. They are divided into three groups according to the unipotency degree of their monodromy operator. The seemingly simplest case is when this operator is the identity. It follows from Kulikov's construction that there is then no degeneration of the surface. However, it is this case that implies that the period map is an epimorphism for surfaces of $K3$ type. This result, which

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is also relevant at present, brought international renown to Kulikov and, as one would now say, greatly increased his citation index.

After defending his Ph.D. thesis in 1977 he began teaching at the Moscow Institute of Transport Engineering, where he worked for 23 years, advancing from junior research fellow to professor and department head. Over these years he solved many beautiful problems and wrote many strong mathematical papers. In 1992 he defended his D.Sc. thesis, about which he himself likes to say modestly that "My doctoral thesis is my Ph.D. thesis, and my Ph.D. thesis is my doctoral thesis". Since 1997 Kulikov has been at the Steklov Institute in the Department of Algebra and Number Theory.

His work on degenerations of surfaces of $K3$ type made him internationally known among mathematicians. This result alone would be sufficient for inscribing his name forever in the history of algebraic geometry. However, it was only the beginning for Kulikov, and the range of his subsequent mathematical interests was not confined to surfaces of $K3$ type. In the last 30 years he has studied the fundamental groups of the complements of algebraic curves on the plane, generic projections of algebraic surfaces, properties of algebraic surfaces of generic type, and many other topics which have by now become classical. He has obtained deep results in each of these directions. For example, he proved Chisini's conjecture by showing that a smooth surface in a projective space is uniquely determined by the branch curve of its generic linear projection onto a projective plane. Kulikov found a remarkable generalization of the classical construction of Burniat, thereby constructing new examples of general type surfaces now known as Kulikov surfaces. Later he and M. Teicher showed that the braid-monodromy type of an embedded algebraic surface determines the surface up to a diffeomorphism, using ideas from the proof of Chisini's conjecture. Together with V. M. Kharlamov, Kulikov constructed a series of examples of algebraic surfaces and varieties of higher dimensions which gave answers to a number of natural open questions of algebraic (and at the same time also of symplectic) geometry, including the first examples of algebraic surfaces and planar cuspidal curves that are not deformation equivalent to their complex conjugates (in these examples the surfaces are deformationally rigid and include, in particular, all fake projective planes), as well as the first examples of algebraic surfaces defined over the field of real numbers with a diffeomorphic (orientation-preserving) action of the complex conjugation that are not deformation equivalent as real surfaces.

Recently Kulikov has obtained a lot of deep results. He studied the problem of finding the number of irreducible components of the Hurwitz space of coverings of the projective line with Galois group a symmetric group that have a fixed monodromy type. He obtained a generalization of the classical Lüroth–Clebsch–Hurwitz theorem on the irreducibility of the Hurwitz space of generic coverings of the projective line of fixed degree with a fixed number of branch points. In particular, he gave new strong criteria for the irreducibility of Hurwitz spaces of this type. For solving these problems he introduced a completely new technique related to group theory — the notion of a factorization semigroup over a group, studied it in detail, and then used it in a purely geometric situation. Jointly with F. A. Bogomolov he studied the question of the differential type of the complement of a configuration of straight lines on the projective plane: when the incidence matrices of the configuration uniquely determine the differential type. To answer this question they constructed new non-trivial operations on the set of incidence matrices.

Kulikov continues his active research and often helps young mathematicians by his unconventional advice and bright ideas. His mathematical creative work is as diverse as ever and, also as before, is characterized by a combination of subtle algebraic techniques with elegant geometric ideas. In addition to his active mathematical work, he finds time for organizing such successful scientific events as the annual school-conference on algebraic geometry in Yaroslavl'. His colleagues and friends hope that he maintains his creative youth and his sharpness of perception of our science for many years to come.

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