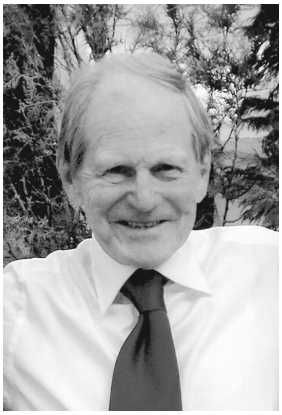
Aleksandar Bakša
1937–2016



Aleksandar Bakša was born on September 28, 1937 in Zagreb, Kingdom of Yugoslavia; he passed away on March 3, 2016 in Belgrade, Serbia.

He finished elementary and High school in Belgrade, and then in 1958 he started to study Mechanics at the Faculty of Science and Mathematics of Belgrade University. After graduating in 1962, Bakša was employed at the Chemical Technological High School in Belgrade. In 1970 he became an Assistant at the Mechanics Department of the Faculty of Science and Mathematics in Belgrade, where he remained until his retirement in 2002. He earned the Magisterum of Science in 1974 with the thesis "*On Optimal Stabilization of Nonholonomic Systems*". Aleksandar Bakša received his PhD from the University of Belgrade with Professor Veljko Vujičić as the adviser two years later. The title of the thesis was "*Stability of Motion of Nonholonomic Systems*". Almost whole scientific carrier Professor Bakša had spent at the Mechanics Department of the Faculty of Science and Mathematics where he became first an Assistant Professor in 1976, then an Associate Professor in 1982 and finally a Full Professor from 1989.

Professor Bakša was a great teacher. His enormous energy, passion and enthusiasm was reflected in his lectures. On undergraduate and graduate studies Professor Bakša had taught a wide class of courses including Statics, Theory of Mechanisms, Stability of Motion, Optimal Control, Rational Mechanics as well as Analytical Mechanics. He also performed several administrative duties, as the Chairman of the Institute of Mechanics at the Faculty as well as the Vice Dean for Academic Affairs at the Department of Mathematics, Mechanics and Astronomy.

The key areas. As a scientist Professor Bakša was interested in many areas of mechanics and mathematics. Most of his research belongs to Stability of Motion, Optimal Control, Geometry and Stability of Nonholonomic Systems, Analytical Mechanics including their application to engineering.

Three broad fields of his scientific interest may be characterized as follows:

- *Geometrization of motion* with following items: Noll's localization concept within elastoplasticity with application to bodies with microstructure; Ehresmann connection in the geometry of systems constrained by nonholonomic, rheonomic, affine constraints; The Hamiltonian principle in the nonlinear theory of elasticity based on an action functional; First integrals of scleronomic systems with nonholonomic constraints by means of the quasicyclic coordinates as well as other related geometrization problems in configuration manifolds.

  As an illustration of his approach to the geometrization filed, we present here the paper: "*On geometrization of motion of some nonholonomic systems*" [1] The paper deals with geometrization of nonholonomic systems. In a special case of Chaplygin systems, linear connections were defined for reduced systems such that the equations of motion take the form of equations of geodesic lines. One can say here that those ideas in more general contest appears almost 20 years later, in beginning of 1990's. From that period this topic becomes on focus to many experts, and the lots of papers and books appeared. Since this paper was published in Serbian, it remains unknown for international scientific community. However, as a pioneering paper in the subject, it is important, and we believe that it will be helpful and inspirative for researchers in the field.

- *Stability as well as optimization issues* with specific themes: Brachystochronous movement on a manifold with Riemannian metric; The stability of a stationary motion of a finite dimensional rheonomic system loaded by nonpotential generalized forces and analyzed by means of general Liapounov theorems; Consideration of Hamilton's principle of nonholonomic systems as a problem of optimal control with either general or linear Chaplygin type constraints; Pontryagin's maximum principle and integral principles of mechanics for systems with time-dependent potential energy subject to nonholonomic constraints; The stability of various equilibrium and stationary motion of Chaplygin's nonholonomic systems examined via Liapunov direct method but without linearization of the perturbed motion as well as The optimal stabilization of steady motions of nonholonomic systems exposed to homogeneous nonholonomic constraints of the Routh form stable in the sense of Liapunov. The last problem was solved such that (i) the control forces make the system asymptotically stable; (ii) a functional that measures the action of the control forces is minimal; (iii) the asymptotic stability of the system can be proved via the Liapounov function that is used in the establishment of the ordinary stability of the system.

  Most of these themes are included in an excellent monograph: "*Stability of Motion*" written jointly by Professors Bakša and Vesković.

- *Applications to engineering problems* with following items: The spatial stability of nonlinear vibrations of motor vehicles where perturbation of one coordinate by an road unevenness may lead to significant increase of other coordinates; The stability of approximate solutions for an equation with a small parameter with generalized Liapunov stability concept; Nonlinear parametric vibrations of motor vehicles acted by deterministic as well as stochastic excitations with using of this stability concept; A choice of a rational method of analysis of polyhedric reinforced concrete shells as a function of their span as well as Optimization of characteristics of vehicles of the middle class from the aspect of oscillatory comfort, stability and steering.

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[1] It is English translation of the original paper: Александар Бакша, О геометризацији кретања неких нехолономних система, Математички весник **27** (1975), 233–240 (in Serbian).

The last theme was studied within the corresponding research project leading to an optimized construction of a motor vehicle of the middle class for the car factory "Zastava" as well as active suspension approach to comfort. The results of this project served to prevent the internal as well as the external resonance typical for parametric nonlinear vibrations of the proposed motor vehicle.

Instead of Conclusion. The deep thinking and mathematical talent of Professor Bakša were astonishing. However, due to his extraordinary modesty his number of published papers was not comparable to the gift of God which he had. He was a true gentleman, calm and with delicate manners like a pearl in a closed shell. In order to admire the beauty of the pearl you must be patient waiting an opening of the shell.

His family life with his dearest wife, Bosa, was also quiet, harmonic and full of love. All of us, colleagues and students, who had a privilege to know him personally, enjoying his warm personality and exceptional wisdom, will dearly miss him, but will always remember him with admiration and respect.

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