

VALENTINE VITALIEVICH RUMYANTSEV

A.V.Karapetyan



Valentine Vitalievich Rumyantsev was born on July, 19th, 1921 in village New Skatovka of the Saratov area where his childhood has passed. We know almost nothing about this phase of Rumyantsev's life. Being a baby he was seriously hurt. V.V.Rumyantsev has early lost his father, so mother and elder brother have formed him as a personality. His brother Boris Vitalievich Rumyantsev being more elder than V.V.Rumyantsev for sixteen years, in fact, had authority as father. V.V.Rumyantsev showed an interest in the exact sciences early and B.V.Rumyantsev has done everything to get a good education for his young brother.

Finishing school in 1940 V.V.Rumyantsev entered the Leningrad shipbuilding Institute but, because of the beginning of the Second

World War, he was obliged to move from Leningrad to Saratov where he became a student of the Physical and Mathematical Faculty in the Saratov University. Completing the University in 1945 V.V.Rumyantsev arrived to Moscow to become a postgraduate of Nikolay Gurievich Chetaev in the Institute of Mechanics of the USSR Academy of Sciences. Chetaev has rendered great influence on Rumyantsev's abilities to work as a scientist and as a lecturer. In 1948 V.V.Rumyantsev defended his candidate thesis and began to work in the Institute of Mechanics as the younger scientific employee of the Department of General Mechanics. Later he has been nominated as the Scientific Secretary of the Institute. N.G.Chetaev was the Director of the Institute of Mechanics that time. V.V.Rumyantsev did not like any administrative job because it took a lot of time and hindered the scientific work. Thirst for the science has made V.V.Rumyantsev a doctoral candidate of the Institute of Mechanics of the USSR Academy of Sciences.

In 1953 V.V.Rumyantsev defended his thesis for the degree of Doctor of Physical and Mathematical Sciences. He was only 32 that time. Rumyantsev's thesis was devoted to the Theory of Stability of rigid bodies with cavities filled with liquid. In the Institute Department of General Mechanics V.V.Rumyantsev worked as a senior scientific collaborator and after N.G.Chetaev's death in 1959 (who was also the Head of this Department) he changed his Teacher at this position.

After reorganization of the Institute of Mechanics in 1965 V.V.Rumyantsev was invited to head the Laboratory (later it became the sector of the Department of Mechanics) of the Theory of Stability and Mechanics of Controlled Systems in the Computing Center of the USSR Academy of Sciences. V.V.Rumyantsev

worked as the Head of the Department of Mechanics about 20 years. During the last years of his life V.V.Rumyantsev worked as an Advisor at the Presidium of the Russian Academy of Sciences. In 1970 V.V.Rumyantsev was elected as a Corresponding Member of the USSR Academy of Sciences and in 1992 he became a Full Member of the Russian Academy of Sciences.

V.V.Rumyantsev started the second job as a lecturer in the M.V.Lomonosov Moscow State University in 1953. He has worked at the Department of Theoretical Mechanics of the Mechanical and Mathematical Faculty almost 54 years. In 1956 he became the Professor of 35 years old. In 2002 V.V.Rumyantsev was awarded with the title "Honorary Professor of the Moscow State University". It has to be noticed that according to this title status only staff employers of the MSU may be awarded with it. V.V.Rumyantsev was the only exception.

Within several decades V.V.Rumyantsev read the general course of Theoretical Mechanics and, after N.G.Chetaev, the special course on the Theory of stability of motion. This course has been prepared and developed by N.G.Chetaev. V.V.Rumyantsev was attentive towards his Teacher's heritage and has preserved the basic content of the course adding several new sections (stability of motion relative to a part of variables, stabilization and optimization of motion, applications of the Lyapunov and Chetaev functions having the complete derivatives with respect to time of the permanent sign, etc.). V.V.Rumyantsev read this special course during more than 40 years until 2001.

Besides in 1959 V.V.Rumyantsev has headed the scientific research Seminar on Analytical Mechanics and Theory of Stability. This seminar was organized by N.G.Chetaev for postgraduate students of the M.V.Lomonosov Moscow State University in the

beginning of the 1950-th. However, it became the city scientific Seminar very soon. V.V.Rumyantsev has been able to expand its status. In the middle of the 1960-th it already became the all-Union Seminar with participation of foreign scientists. V.V.Rumyantsev has headed this Seminar during 48 years till his death. Now this Seminar has name of Academician V.V.Rumyantsev and continues its work successfully.

V.V.Rumyantsev always had many pupils both in the Moscow State University (students, senior students and post-graduate students), and in the Computing Center of the USSR (Russian) Academy of Sciences (post-graduate students, doctoral candidates and research engineers). He has prepared more than 60 scientists having PhD. Almost half of them defended doctoral theses later. V.V.Rumyantsev has never refused in giving consultations and support for young and not young researches turned to him both from the state and from abroad even when they were not his pupils. Meeting with the youth V.V.Rumyantsev showed the scientific generosity which is extremely rare in our time, i.e. he proposed statements of new problems and methods for their solution without any profit from his own side. V.V.Rumyantsev objected to assign his name as the co-author of new papers prepared by another researches. For this reason there are a few of original scientific works written by V.V.Rumyantsev in co-authorship and most of them are scientific surveys.

V.V.Rumyantsev has published about 180 scientific works, including 7 monographs. The mainframe results in dynamics of bodies with the cavities filled with liquid belong to him. Moreover, the general theory of V.V.Rumyantsev on stability of motion of bodies having liquid has the principal value. The success of the construction of this theory is caused by the extremely prosperous

concept of the stability of motion of such systems. V.V.Rumyantsev has proposed to study the stability of motion of a rigid body with cavities containing liquid relative to the variables describing motion of the body and to the variables such as, for example, the kinetic and potential energies of liquid which describe motion of liquid in the integral way. Thus the problem of treating such systems with infinite number of degrees of freedoms ("rigid body plus liquid") is reduced to the research of the stability with respect to a finite number of variables. In frames of this statement of the problem V.V.Rumyantsev has obtained both the general theorems on the stability of motion of bodies with the cavities containing liquid and the conditions which are simple enough and can be easily interpreted. The set of specific problems having theoretical and practical value has been solved. The stability of motion of satellites with liquid was considered among them.

The results of V.V.Rumyantsev on the stability of steady motions (equilibriums, relative equilibriums and stationary motions) of rigid bodies having liquid filling are also of the principle significance. With the help of the general theorems on stability of motions of bodies with cavities filled by liquid the solution of such problems are reduced to the problem of minima of the potential energy (initial, modified or reduced potential energy correspondingly) of the system "body plus liquid". The solution of the latter depends on both the position of the body and of the form of the free surface of liquid. Under rather common assumptions V.V.Rumyantsev has proved that this problem of finding minimum may be reduced to the problem of finding minimum of a function of a finite number of variables. To do this, first of all, it is necessary to find the form of the free surface of liquid with which the potential energy has minimum providing that the body takes any position.

This form depends on the body positions, of course. Then it is necessary to calculate the potential energy of the system “body plus liquid” for the specified form of the free surface of liquid. The obtained function depends only on the rigid body position. Minimum of this function ensures minimum of the potential energy of the original system.

V.V.Rumyantsev's results on the stability of motion of bodies having ncavities filled with liquid have been summed up in the monograph "Dynamics of Rigid Bodies with Cavities Containing Liquid" (Moscow: Nauka, 1965) that was written together with N.N.Moiseyev. In 1980 this monograph has been awarded with the State Prize of the USSR. Later these results have been expended to arbitrary hybrid systems i.e. to systems of rigid bodies with elastic and liquid elements.

V.V.Rumyantsev's development of the general theory and stabilization of motion with respect to the part of variables brought him the world popularity. In fact, the basis of this theory is in V.V.Rumyantsev's researches on dynamics of rigid bodies having cavities with liquid. Later V.V.Rumyantsev had abstracted away this specific problem and constructed the general mathematical theory which became well known all over the world and began to develop both in the state and abroad. V.V.Rumyantsev's results on stability of motion with respect to a part of variables were published in monograph "Stability and Stabilization of Motion Relative to a Part of Variables" (Moscow: Nauka, 1987) written together with V.V.Rumyantsev's pupil A.S.Oziraner (1946-1995). These results are widely applied in the various areas of science. In particular, they are the foundation of the theory of stability of stationary motions and of invariant sets of mechanical systems

moving under forces of various structures. The works of both V.V.Rumyantsev and many of his pupils are devoted to the development of this theory. V.V.Rumyantsev's results on the theory of stability of stationary motions of mechanical systems were published in his monograph "On the Stability of Stationary Motions of Satellites" (Moscow: VTs AN SSSR ed., 1967) and in the survey "Stability of conservative and dissipative systems" (Moscow: VINITI ed., 1983) that was supplemented with new results, translated in English and published in the edition of N.-Y.: Hemisphere, 1991. This survey was written together with V.V.Rumyantsev's pupil A.V.Karapetyan. For the cycle of works on the theory of stability of motion V.V.Rumyantsev was awarded with the Lyapunov Gold Medal of the Russian Academy of Sciences in 2004.

The significant part of V.V.Rumyantsev's scientific heritage contains his works on dynamics of rigid bodies and gyrostats in various force fields (body with a fixed point, body in the central gravitational field, body suspended with a string, body on a plane, etc.). In particular, V.V.Rumyantsev has obtained the complete solution of the problem on the secular stability of permanent rotations of a heavy rigid body about a fixed point. He has described also the visual representation of the obtained results by means of specifying the domain of stability of permanent rotations on the intersection of the Staude cone with the Poisson sphere. These V.V.Rumyantsev's results were awarded with the Chaplygin Prize of the USSR Academy of Sciences in 1958.

V.V.Rumyantsev has obtained the fundamental results in the problem on motion of a rigid body suspended to a fixed point by means of a string or of a rod. In particular, V.V.Rumyantsev has noted that the mode of strengthening of the string or of the rod to the

body plays the essential role. V.V.Rumyantsev together with his pupil V.N.Rubanovskiy (1941-2002) has given the exhaustive analysis of the problem on the existence, stability and bifurcation of stationary motions of a body suspended with a rod. These results were awarded with the State Prize of the Russian Federation in 1996.

The important results have been obtained by V.V.Rumyantsev in the problems of dynamics of gyrostats on the motionless plane. V.V.Rumyantsev was the first who has investigated the stability of permanent rotations the Celtic stone having a rotor.

In V.V.Rumyantsev's works on Analytical Mechanics the development and various modifications of the variational principles and the group methods of Mechanics have been given. V.V.Rumyantsev has expended the principle of Gauss to systems with non-ideal constraints, proved the variational Chetaev principle and specified the necessary and sufficient conditions under which the Hamilton, Lagrange and Jacobi actions have stationary value for the actual motion of mechanical systems with differential constraints. V.V.Rumyantsev has expended the Poincare-Chetaev equations to the case of not closed system of operators of virtual displacements. Basing on this fact he has obtained the most general equations of dynamics which are suitable for the description of motion of both holonomic and nonholonomic systems with use of generalized coordinates or quasi-coordinates including redundant variables.

V.V.Rumyantsev's spent many efforts and time for scientific and organizational work. Within three decades he headed the Editorial Board of the academic Journal "Applied Mathematics and Mechanics". He was member of the Bureau in the Department of problems of mechanical engineering, mechanics and processes of

control. He was member of the Presidium of the National Committee on Theoretical and Applied Mechanics.

V.V.Rumyantsev has taken active part in organization and carrying out all-Union and all-Russia Congresses on Mechanics, the Chetaev Conferences, International Symposiums on Classical and Celestial Mechanics, etc.. He has supervised over various grants of the Russian Fund of Fundamental Researches, of INTAS, of the Federal Special-Purpose Program “Integration”, etc. In essence, V.V.Rumyantsev was the Head of the Moscow branch of the N.G.Chetaev scientific school on Analytical Mechanics and Theory of Stability within almost 48 years until his death happened on June, 10th, 2007.

Transl. by A. S. Sumbatov