



### **Professor Anatolii Isakovich Lurie (1901 – 1980)**

See:

[http://mp.ipme.ru/Zhilin/Zhilin\\_New/PALurie\\_e.htm](http://mp.ipme.ru/Zhilin/Zhilin_New/PALurie_e.htm)

<http://apm-conf.spb.ru/2002/Lurie.html>

[http://pt.wikipedia.org/wiki/Anatolii\\_Isakovich\\_Lurie](http://pt.wikipedia.org/wiki/Anatolii_Isakovich_Lurie)

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Anatolii Isakovich Lurie was born in 1901 in Mogilev. In 1918 he graduated from a high school (gymnasium), and was admitted to the Faculty of Physics and Mechanics of the Saint-Petersburg Polytechnic Institute, named after Peter the Great, where he has been working ever since. In 1939 he was conferred the degree of Doctor of Science. He headed the Department of Theoretical Mechanics through the period from 1936 to 1941, and from 1944 to 1977 he was the Head of the Department of Dynamics and Strength of Machines (which was renamed as the Department of Mechanics and Control Processes in 1960). A.I. Lurie was a Corresponding Member of the USSR Academy of Sciences, Division of Mechanics and Control Processes. He was a member of the Presidium of the National Committee for Theoretical and Applied Mechanics and a member of the National Committee for Automatic Control. A.I. Lurie was a member of the Editorial Boards of the renowned Russian journals "Applied Mathematics and Mechanics", and "Mechanics of Solids".

His scientific activity, lasting for more than half a century, has brought remarkable achievements. He wrote a number of magnificent books:

1. Nikolai, E.L and Lurie, A.I. Vibrations of the Frame-type Foundations. Leningrad, Moscow, Gosstroyizdat, 1933, 83 pp.
2. Loitsianskii, L.G. and Lurie, A.I. Theoretical Mechanics. In three volumes. Leningrad, Moscow, GMTI, 1934.
3. Lurie, A.I. Statics of Thin-walled Elastic Shells. Moscow, Gostekhizdat, 1947, 252 pp.
4. Lurie, A.I. Some Nonlinear Problems of the Theory of Automatic Control. Moscow, Gostekhizdat, 1951, 216 pp.
5. Lurie, A.I. Operational Calculus and its Application to the Problems in Mechanics. Moscow, GITTL, 1951, 432 pp.
6. Lurie, A.I. Three-dimensional Problems of the Theory of Elasticity. Moscow, GITTL, 1955. 492 pp.
7. Loitsianskii, L.G. and Lurie, A.I. A Course in Theoretical Mechanics. In two volumes (5th edition). Moscow, GITTL, 1955, 380 pp., 596 pp.
8. Lurie, A. I. Analytical Mechanics. Moscow, Nauka, 1961, 824 pp.
9. Lurie, A.I. Theory of Elasticity. Moscow, Nauka, 1970, 940 pp.
10. Lurie, A.I. Nonlinear Theory of Elasticity. Moscow, Nauka, 1980, 512 pp.

The last book was written when A.I. Lurie was already seriously ill. He did not live to see the proofs, nor did he see the original Russian edition of the book. It has been translated into English by his son K.A. Lurie and published by North Holland Publishers in 1990.

The original style of Lurie's scientific work manifested itself already in his early publications; this is the ability to establish strong bonds between the achievements of classical mechanics and the needs of modern technology. His books are unparalleled by a number of practical applications. A. I. Lurie became an ardent promoter of the so-called direct, or invariant, vector (and later tensor) calculus. It is now difficult to imagine that once the relations in theoretical mechanics were expressed and written in the cumbersome coordinate form!

The work by A.I. Lurie in the field of application of operational calculus to the study of stability of mechanical systems with distributed parameters brought him a great fame. This study, as well as his direct contacts with mathematicians stimulated research in the field of distribution of the roots of quasi-polynomials.

Probably the greatest resonance in the world scientific community was produced by Lurie's work on the theory of absolute stability of control systems. The very statement of the problem was pioneering, as well as the application of the Lyapunov function method to its solution. These results initiated an enormous flow of scientific literature.

Professor Lurie is also the author of a number of articles and books on the theory of elasticity. He devoted the last fifteen years of his life exclusively to those problems. The typical feature of this work was its focus towards obtaining analytical results. He did not pay any attention to numerical methods that have become so popular nowadays.

Professor Lurie was an extraordinary person. He was an attentive and respectful listener, but his interest sharpened when a colleague demonstrated his own scientific ideas. This feature was especially attractive for the young researchers and lecturers who wanted his opinion. His study was always full of visitors seeking his advice, his review of papers, or simply his support. He worked hard through all of his life, writing books, giving lectures, reviewing papers. He disliked and even might be hostile to the idle, though possibly talented people.

In the spring of 1979 Professor Lurie underwent a serious surgery. It took him the whole summer to recover after it. In September he came back from Moscow. He looked fine. He said to me (I was already acting as the Head of his Chair): "I am going to read my favorite "Theory of Elasticity" course". I tried to object to this, and offered to read his lectures as well as mine, to stimulate him to relax. He reacted rather sharply and insisted on reading his own course. However, he was able to continue only until October. In November, he gave up saying that it was too difficult. He died on 12 February 1980. He was 78 years old.

I hope that the English-speaking reader will enjoy "Analytical Mechanics" by A.I. Lurie. A good and talented person can write only a good book!

---Written by Professor Vladimir A. Palmov, Head of Lurie's Chair

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A man cannot choose his birthday or birth place. However, time and habitation country significantly influence upon the making of a person and determine the character of his activity. Nevertheless, at all times and in all countries the individuals are born, who are realized as self-independent and self-sufficient creatures. Such persons play the role of "evolution catalysts" for the society, into which they are involved. The problems solved by them are never accidental but determined by the higher necessities of the society. The main feature of a realized individual is a capacity of a person not only to perceive intuitively the society higher necessities but to take them as a guide to the action. Therefore, this is impossible to make a correct evaluation of a contribution of any person into the evolution of a community (either of its certain part) if one does not realize clearly the state of this community and its necessities at the evolution stage considered.

No doubt, Anatoly Isakovich Lurie had realized himself as a self-independent individual, whose versatile fruits of work we sense so distinctly. The aim of this presentation is a discussion of A.I. Lurie's contribution into evolution of mechanics in Russia. A.I. Lurie had began his self-independent investigations in mechanics in 1925 all at once on graduating from the Faculty of Physics and Mechanics of Leningrad Polytechnical Institute. Think of Russia being in 1925! The previous decade resulted in an extremely hard state for Russia. The First World War, the October Socialist Revolution, and, finally, the fratricidal civil war, which is the worst and the most dangerous among all kinds of wars. All this had led to the scarcity and dissociation of the Russian brain-power to nearly complete destruction of relatively weak industry together with the total absence of finances for purchase of needed equipment. In addition, Russia was, actually, in a complete isolation from the all-world community. Consequently, development of the native industry became one of immediate tasks. Traditionally, only ship building was rather well-developed, but other fields of industry (such as mechanical engineering, power engineering, turbine construction, instrument-making and aircraft industries, etc.), they all were present in embryo. Everything mentioned above had to be built up anew. First of all, tens of thousands of skilled engineers were to be trained. It should be taken into account, that these skilled engineers had to be prepared from a relatively uneducated medium, since schools worked under abnormal conditions in 1914-1922 as well. For training a skilled engineer brain-power competent specialists and, also, text-books were needed. It cannot be said that there were no scientists in the field of mechanics in Russia.

Suffice it to recall such first-class scientists as N.E. Zhukovsky, I.G. Bubnov, I.V. Meschersky, A.A. Fridman, A.N. Krylov, P.F. Papkovich, E.L. Nicolai, and many others. However, they were extremely few in number for

such a vast country as Russia. As for text-books on mechanics for universities, they were actually absent. Just then, the generation of Russian scientists, to which A.I. Lurie belonged, had to start the work. Creative work of the above-mentioned scientists received a high appraisal by the launching of the first in the world artificial satellite on October 4th, 1957, along with the fact that to 1960 the technical education in Russia was recognized as one of the best in the world by the international community. On graduating from the Polytechnical Institute A.I. Lurie hold the post of a lecturer at the chair "Theoretical Mechanics" of the institute. Hereafter, A.I. Lurie began his persistent research work. It is necessary to emphasize that A.I. Lurie was utterly interested in various fields of mechanics and of control theory. It is accounted for by the fact that A.I. Lurie was tightly concerned with organizations engaged in development and production of new technique. Among the organizations, Leningradskii Metallicheski Zavod (a Leningrad Metal Plant), Osoboe Tekhnicheskoe Byuro (the Special Technical Department), and Osoboe Konstruktorskoe Byuro (the Special Constructor Department) to be pointed out in the first place. As it is known, creation of a new technique is accompanied by numerous problems associated with mechanics and the control theory. Over the post-war years, contacts of A.I. Lurie with industrial organizations were essentially widened. Multiformal demands of practice made the scientist to perform his investigations simultaneously in various directions. Therefore, in describing the works of A.I. Lurie on mechanics we ought to divide the works into separate groups and to break the chronological succession. As for investigation on the control theory, into which A.I. Lurie made a valuable contribution, they represent the subject of a separate consideration.

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The following is from:

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Anatoly I. Lurie (19 July 1901 - 12 February 1980) was born in Mogilev (Belorussia). He was an outstanding scientist in the field of rational mechanics and theory of control processes. Graduated from Faculty of Physics and Mechanics of Leningrad Politechnic Institute (1925), D.Sc. in technical sciences (1933), Professor (1929), a Member of Academy of Sciences of USSR (1961). A member of the National Committee of USSR on Theoretical and Applied Mechanics. A Head of Department in the Leningrad Politechnic Institute. A consulting Professor in the Central Institute of Boilers and Turbines. A.I. Lurie made a great contribution into development of mechanics and theory of control processes in Russia, in particular, into the theory of the spacecrafts control. A.I. Lurie was a brilliant teacher, and his students, many of whom became well-known scientists now, keep grateful recollections of him. A.I. Lurie was an author of fundamental works in the field of theory of elastic media and structures. His investigations advanced the operator approach in the control of systems with distributed parameters. His monograph "Some nonlinear problems of the automatic regulation theory" (1951) had a great value for the development of control theory. He made a great contribution in the theory of stability, and also in methods of description of control systems. In his works the ideas of classical mechanics were naturally united with up-to-date technical problems. For exaple, his remarkable monography "Analytical mechanics" (1961) includes developments in the cosmic dynamics, results in the theory of optimal control and in the theory of nonlinear elasticity.

A.I. Lurie is an author of 8 monographies, including

Statics of Thin Elastic Shells, 1947.

Three-dimensional Problems in Theory of Elasticity, 1955.

Theory of Elasticity, 1970.

Nonlinear Theory of Elasticity, 1980.

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