



**OBITUARY**

**ALEXEI VASILIEVICH LUIKOV  
1910-1974**

## ALEXEI VASILIEVICH LUIKOV 1910–1974

IN THE month of June 1974 the International Journal of Heat and Mass Transfer lost one of its founders, the Editor for the U.S.S.R. and East Europe countries, the prominent Soviet scientist, Academician of the Academy of Sciences of the B.S.S.R., Alexei Vasilievich Luikov. He died unexpectedly on the 28th of June 1974 at the age of 63.

The merciless death has torn from among us a great scientist and a great man. The scientific community in the field of heat and mass transfer has suffered a heavy loss in the death of A. V. Luikov.

Alexei Vasilievich Luikov was born in 1910 in the town of Kostroma. He graduated from the Yaroslavl Pedagogical Institute, Physico-Mathematical Department, in 1930 and in 1935 successfully defended his candidate thesis. Though a very grave disease confined him to bed through the years 1936–1939, A. V. Luikov wrote two monographs during these years, one on the kinetics and dynamics of drying and the other on heat conduction and diffusion and upon convalescence, in 1939, defended his doctorate thesis.

A. V. Luikov created a school on one of the most important divisions of thermal physics—heat and mass transfer in capillary-porous bodies and disperse media with phase and chemical conversions. This school won world recognition and well-merited international prestige. The school is distinguished for the complex investigation into heat and mass transfer and their interrelations.

A. V. Luikov developed the mechanism of heat and moisture transfer in capillary-porous bodies and on this basis suggested the system of differential equations of heat and mass transfer in capillary-porous bodies. This system of differential equations was solved for a wide number of problems and different boundary conditions. The great influence of molar moisture transfer caused by thermal and diffusion slip was shown, and as a result, a law was formulated on mass transfer in capillary-porous bodies for non-isothermal conditions.

A. V. Luikov developed the methods for determining optimum and rational drying regimes based on the regularities of the heat- and moisture-transfer mechanism in capillary-porous bodies. In particular, the theory of an evaporation zone deepening in the process of drying received its completion in his works.

Numerous investigations by Luikov provided the basis for creating a modern theory of drying moist materials.

Luikov showed that most of the problems (especially transient) of simultaneous heat and mass transfer for a body in a gas flow required conjugated mathematical formulation, since for such problems it was impossible

to formulate *a priori* the boundary conditions at the interface between the body and the surrounding medium. New effective methods and operative means were developed for solving conjugated problems. Thus, a general theory of heat and mass transfer in capillary-porous bodies interacting with the surrounding medium was developed, similarity numbers and criteria of such processes of mass and energy transfer were established.

Luikov was the first to generalize Prigogine's principle on the rate of entropy change in transfer processes. As a result, a new system of linear transfer equations was obtained differing from Onsager's system in that the fluxes depend not only on thermodynamic motive forces, but on the rate of their change and on the time flux-derivatives as well. From this system of generalized relationships the transfer equations were obtained accounting for the finite rate of substance propagation, and the hyperbolic differential heat conduction and diffusion equations were derived.

In his work Luikov extensively applied the Laplace–Heaviside operational method for the solution of unsteady-state problems of heat conduction theory. As a result the relation was established between the similarity theory (theory of dimensionless variables) and the operational calculus, and the solutions in transformations acquired a specific physical meaning.

For the first time the boundary conditions of the fourth kind were introduced into the heat conduction theory. Luikov showed that strict formulation of the problems of convective heat transfer involving interaction of the surface with the surrounding medium corresponded not to the boundary conditions of the third kind, as had been formerly considered, but to the boundary conditions of the fourth kind. Thus, the boundary conditions of the fourth kind acquired highly important and practical significance in the theory of convective heat transfer.

Luikov developed a new method of solving non-linear heat-conduction problems, when thermophysical properties depend on co-ordinates. From this generalized method a number of well-known methods followed for solving such problems.

From 1931 Luikov was developing rapid methods for complex determination of thermophysical properties. These methods helped to demonstrate new phenomenon of heat-conduction anisotropy of disperse systems, and polymeric solutions conditioned by shear flow. It was shown that fluids with slowly erasing or infinitely large mechanical memory containing elongated elements (linear macromolecules, solid particles) acquired tensor thermal conductivity as a result of shear flow. The components of the tensor of

the heat-conduction coefficient differed from its isotropic analogue by 200–300 per cent.

In recent years Luikov paid special attention to, and took a lively interest in, scientific problems arising at the junctions of classical disciplines, such as rheophysics, aero-thermo-optics, plasmochemistry and to other perspective trends.

A characteristic feature of the work of Luikov was the combination of fundamental physical research with practical engineering solutions of the problems and their wide introduction into practice. In 1931 he got his first author's claim on the invention of a "Variable Pressure Drier" as the result of his researches on dehydration of moist porous materials under different pressures. Under Luikov's guidance new equipment was designed and constructed for drying photo-emulsions, a model of which was exhibited in Brussels and Geneva in 1958. On the basis of his outstanding theoretical investigations on freeze-drying a plant was built in the U.S.S.R. in 1955; its industrial capacity had then no equal elsewhere in the world.

For more than 40 years of his research work A. V. Luikov published about 250 papers and 18 monographs including "Theory of Drying", "Transfer Phenomena in Capillary-porous Bodies", "Heat Conduction Theory", "Theory of Energy and Mass Transfer", "Handbook of Heat and Mass Transfer", etc. His monographs were translated and published in England, Germany, France, Hungary, U.S.A. and other countries. In 1951, for his monograph "Theory of Drying" (1950) A. V. Luikov was awarded the State Prize of the first degree and for his monograph "Heat Conduction Theory", issued twice in the U.S.S.R. and published abroad, A. V. Luikov received the highest award in power engineering in the U.S.S.R., the I. I. Polzunov Award, in 1969.

Under Luikov's guidance 131 candidate and 27 doctorate theses were prepared and successfully defended.

In addition to his scientific research work, A. V. Luikov was Editor-in-Chief of the Journal of Engineering Physics since 1958, U.S.S.R. Editor of the International Journal of Heat and Mass Transfer since 1959, Co-chairman of the U.S.S.R. Advisory Editorial Board of the Journal "Heat Transfer—Soviet Research", Chairman of the Committee on Drying of the Council of Scientific and Engineering Societies of the R.S.F.S.R., Vice-chairman of the National Committee for Heat and Mass Transfer of the U.S.S.R. Academy of Sciences, delegate of the Assembly of International Heat Transfer Conferences, member of the Scientific Council of the International Centre for Heat and Mass Transfer, Chairman of the Scientific Council of the

Centre for Heat and Mass Transfer of the Academies of Sciences of socialist countries, member of the Editorial Board of the Publishing House "Energiya".

Exceptionally fruitful were A. V. Luikov's activities as the Director of the Heat and Mass Transfer Institute of the Byelorussian Academy of Sciences to which post he was named in 1956. In a short period of time, the initially small team of thirty workers grew into a world-known scientific centre on thermal physics. For these years the Institute gave life to a number of separate institutes such as the Institute of Nuclear Engineering, the Institute of Water Problems, the Byelorussian Division of the All-Union Power Engineering Institute. The Heat and Mass Transfer Institute was the sponsor and organiser of the All-Union Heat and Mass Transfer Conferences which were held every fourth year from 1961 in Minsk and which were attended by thousands of Soviet and hundreds of foreign scientists. For great scientific achievements and successes in training scientific personnel, in 1969, the Institute was honoured with the high governmental award, the Order of the Red Banner of Labour.

A. V. Luikov's great contributions to the thermal science received deserved recognition. In 1956, he was elected an Academician of the Byelorussian Academy of Sciences, in 1957, a member of the Academy of Construction and Architecture of the U.S.S.R., in 1957, he was conferred with the title of Honoured Scientist of the R.S.F.S.R., in 1967, A. V. Luikov was honoured with the highest award in the U.S.S.R., the Order of Lenin, and in 1970 received the Order of the Red Banner of Labour.

A. V. Luikov ascribed great importance to international cooperation of scientists and strived for its fostering. His achievements in this field were acknowledged in many countries of the world. In 1969, Luikov was elected an Honoured Foreign Member of Mechanics Department of the Polish Academy of Sciences, in 1971, for his contributions to the development of heat and mass transfer science in Czechoslovakia he was awarded by the Government of the Republic of Czechoslovakia the Gold Medal "For Merits in Development of Friendship and Co-operation with ČSSR", in 1973 A. V. Luikov was awarded the Gold Medal of the French Institute of Combustibles and Energy.

Professor A. V. Luikov has passed away in the prime of his creative activity when he still cherished many scientific endeavours. His death is a heavy loss to the heat and mass transfer science and deep regret to those who worked with him, knew him and loved him. We shall revere the memory of Academician A. V. Luikov.