Pergamon

PII: S0021-8928(97)00116-0

J. Appl. Maths Mechs, Vol. 61, No. 6, pp. 863–873, 1997

0021-8928/97 $24.00+0.00

ON THE NINETIETH BIRTHDAY OF LEONID IVANOVICH SEDOV†

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November 14, 1997, the ninetieth birthday of the eminent Russian scientist Academician Leonid Ivanovich Sedov, was an occasion to be celebrated in the scientific and cultural life of our country.

Sedov joined the scientific community at a time of rapid progress in science in the USSR. In mechanics and mathematics, in particular, theoretical and practical engineers were constructing a multistorey structure of the motion of fluids on the solid foundations that had been laid down by Zhukovskii and Chaplygin. The young, talented Leonid Sedov had the baton passed on to him by his great predecessors and, through his huge creative enterprise, provided a theoretical completeness to much of modern fluid mechanics. He published his already renowned monograph "Plane problems of fluid dynamics and aerodynamics". This contained elegant formulations and solutions of all the basic problems of the title, allowing for transient effects, the formation of vortex sheets, skimming over the water surface, multiconnectivity of the region of definition of the solution, and so on. In the course of this work, Sedov obtained numerous results in pure mathematics, including the now famous Keldysh–Sedov formula for a boundary-value problem in the theory of functions of a complex variable, often encountered in applications.

From this monograph, as from the trunk of a healthy young tree, many areas of science grew, thereby creating a great crown of new formulations and solutions of problems in specific areas, further monographs, and so on.

Sedov's creative genius was next applied to the theoretical development of a wide range of problems to do with the unsteady motion of gases. The start of this research was marked by the publication of his work on powerful explosions in air, an event which was astonishing both in the boldness of the mathematical model used and in the elegance of the exact solution. This (the 1940s) was the time of the "arms race" and the construction of nuclear weapons, when many engineers were interested in the

†*Prikl. Mat. Mekh.* Vol. 61, No. 6, pp. 899–902, 1997.

effect of explosions. From its very publication, Sedov's result was considered to be one of the most elegant classical achievements in fluid dynamics. The method he devised for the problems of explosions helped to "reorganize" an entire scientific field and invent the theory of the use of dimensional analysis of physical quantities and the similarity of processes to obtain a satisfactory representation of the numerical characteristics of particular phenomena and construct important classes of solutions of what came to be known as self-similar problems.

The results were presented in a book: *Similarity and Dimensional Methods*. Like "Plane problems", this publication was an important landmark. It ran through an amazing number of editions and reprints—ten in Russian and many in different languages (English, Chinese, French and Vietnamese among others). Again, it encouraged research in various areas in several aspects of modern mechanics and physics. Sedov himself used the method of self-similar solutions to obtain some excellent results in the dynamics of stars, to describe the "life and death" of those magnificent and enigmatic natural formations which, according to Kant's dictum, alone in the sky and together with the moral law in us, are capable of engendering the most intense and elevated intellectual human experience. The exact solutions of the improved gas-dynamic problems obtained by Sedov and his disciples both revealed new effects in the dynamics and explosive evolution of stars and offered a theoretical interpretation of known empirical regularities. All these results provided sturdy "building material" for science, this time in modern astrophysics.

Probably one of the most characteristic features of Academician Sedov is the way in which he has been able to combine research and teaching, carrying out intensive investigative work, giving lectures, presiding over numerous research seminars, and supervising undergraduates, post-graduates and doctoral students. For many years his famous Moscow seminar functioned in the old building of Moscow University, and then at the Mathematical Institute of the Academy of Sciences, where it continues today. The seminar was the core of Sedov's scientific school and is acknowledged by academics in mechanics as one of the best in the world.

This combination of scientific research and teaching generated the third important part of Sedov's creative work—the development of general theoretical methods for constructing the basic governing equations for the mathematical modelling of mechanical, physical and similar field processes. Here too he was able to "impose order" by formulating the principles of the use of the mathematical apparatus of tensor analysis and non-linear tensor functions, very general conclusions and methods of modern thermodynamics and specific aspects of physical, chemical and other laws, again from the standpoint of very general scientific ideas about the latter.

All this work took place as we watched, while Sedov "did" science and gave lecture courses about it to students and post-graduates at Moscow University. More books and monographs appeared (including, in particular, the now well-known university textbook on the mechanics of continua; the actual course of the mechanics of continua was used in the programme for teaching mechanics and mathematics at Moscow State University that Professor Sedov initiated), and concrete results were obtained. Among the latter was the now famous, widely quoted general variational principle, so useful for constructing mathematical models of the mechanics and physics of continua.

Academician Sedov is a remarkable example of creative scientific longevity. He continues to conduct active day-to-day research, to keep contact with students, some of whom are young enough to be his grandchildren, and to present research papers. He has recently extended his interest to difficult problems in the theory of relativity with no obvious or generally agreed answer. This, of course, is not unusual for him—he has always been attracted by basic problems in science and has always been able to find the appropriate "tool" to solve them. He and his many generations of students have obtained a huge number of results on that basis. This is the principal characteristic of Academician Sedov's school of research.

There is one more area of Sedov's work that should be mentioned: his musings on the life and work of prominent scientists of the past and present. These provide an original and often totally new view on what would appear to be well-known facts and achievements of famous scientists of the past, the "effect of being present" and his own feelings in stories about his contemporaries.

Finally, his speeches and numerous publications on adherence to principle, the honour and dignity of the scholar, pseudo-science, the vital importance of scientific criticism, the pernicious influence that administrative and power structures have had on the progress of science, and the way in which its results are used to benefit humanity, comprise another very important part of his scientific work (scientific work indeed!), without which one could not appreciate the full extent of the ideas of this eminent contemporary of ours. This work has had, and continues to have, a productive impact on the progress of science, on the educational process, on the emergence of new skilled personnel in our country, and on the creation of a healthy, moral "environment" for scientists.

Academician Sedov's many students, disciples and colleagues and the editorial board and editors of this journal congratulate him on his ninetieth birthday and wish him many more years in which to achieve whatever he wishes.

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Translated by R.L.