

Jacek Szarski

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Jacek Szarski was born as a son of a well-known Cracow family. In 1938 he began studying mathematics at the Jagiellonian University in Cracow. During the World War II he continued his studies at the Underground University. After the war he got his Master's degree and half a year later he received his Ph. D. for the thesis written under the supervision of T. Ważewski.

In 1947 he was given the post of assistant at the Jagiellonian University professor in acknowledgment of his work on partial differential inequalities of the first order.

In 1954 he was promoted to associate professor and in 1962 to full professor.

He had been an associate member of the Polish Academy of Sciences since 1969.

His scientific work will be sketched below. But his activity was never limited to mere research. His excellent, carefully prepared lectures were much appreciated by all students. He conducted many seminars, most important being that on differential equations with T. Ważewski and on mathematical problems in physics and technology, continued after M. Krzyżański. He was the director of the Mathematical Institute of the Jagiellonian University (1968–1977) and for some time the Dean of the Faculty and the vicerector of the University.

In 1979 the Polish Mathematical Society elected him its president.

Professor Szarski's position in the society was also largely due to his personality. Profoundly well-wishing and helpful he esteemed his partners. He enjoyed music and sport and possessed good knowledge of arts.

He died skiing down the slope of Gubałówka in Tatra Mountains.

The main research field of J. Szarski was the theory of differential equations. He was one of the creators of the theory of differential in-

equalities. The theory which gave the qualitative approach to several basic problems in differential equations. He was the author of the pioneering monograph *Differential inequalities* (Monografie Matematyczne, Vol. 43 (1965); second edition 1967). This monograph, the first in scientific literature on the subject, presents in a clear and systematic way the power and the range of applications of methods of differential inequalities. It includes several new results of the author not published elsewhere as well as several new original methodological ideas. The monograph as well as the original papers of J. Szarski concern the so-called non-stationary differential inequalities. More precisely one deals here with three kinds of inequalities: ordinary, parabolic and first order partial differential inequalities. The common point here is that the inequalities are roughly speaking of the form

$$\frac{\partial u}{\partial s} < F(s, Au).$$

Au may stand here for a vector valued operator with entries being the suitable partial derivatives of u up to the first or second order (second order in parabolic case). In the general case Au can depend on integrals of u or can be of more general character (differential-functional inequalities).

All we said above, when combined with the method of comparison systems has been applied by J. Szarski to get new results. They concerned the classical problems of estimations, uniqueness and continuous dependence of solutions on initial and boundary data. His main interest concerned the first order partial differential inequalities and parabolic inequalities.

Besides the theory of differential inequalities the research interest of J. Szarski concentrated on several topics related to ordinary and partial differential equations. We mention here his achievements concerning asymptotic behaviour of solutions, uniqueness, existence and approximation problems, completely integrable partial first order equations, selected topics related to hyperbolic equations and to systems of differential-functional equations. In one of his papers he gave a precise mathematical picture of some subtle problems in special relativity.

In another paper he gives the complete discussion of the equation

$$\left(\int_a^b u(t, y) dy \right) u_x(t, x) = \lambda(t, x) u(t, x),$$

which describes a model for some technical problem, the so-called *sieve* problem.

We have to mention here his elegant example of an equation $z_x + a(x, y)z_y = 0$, where $a(x, y)$ is of the class C^∞ and nevertheless every one of its C^1 solutions on \mathbf{R}^2 is constant.

J. Szarski was the first to give some explicit estimations related to the characteristic conoide of the hyperbolic equation

$$\sum_{j,k=1}^{m-1} a_{jk}(x_1, \dots, x_m) \frac{\partial^2 u}{\partial x_j \partial x_k} - \frac{\partial^2 u}{\partial x_m^2} = 0,$$

where $\sum_{j,k=1}^{m-1} a_{jk}(x) \lambda_j \lambda_k$ is a positive definite form.

He was the first who found out an essential gap in the proof of some fundamental estimates given by Schauder in his famous paper on quasi-linear hyperbolic equation. Later on together with T. Ważewski he gave the proper proof, by making use of a suitable differential energetic inequality.

Together with N. Aronszajn and A. Krzywicki he proved a strong result concerning the so-called unique continuation property of solutions of (roughly speaking) second order elliptic equations.

Last but not least we have to note that J. Szarski published several lecture notes on partial differential equations and wrote papers on mathematics and its role in the general culture and education.

The research achievements of J. Szarski sketched above ensure his durable contribution to the development of mathematics. This together with his activities in teaching, education of several generations of young mathematicians, in the organizing of the mathematical life in Poland, especially in Kraków, shall have its lasting effect on the development of mathematical culture.
