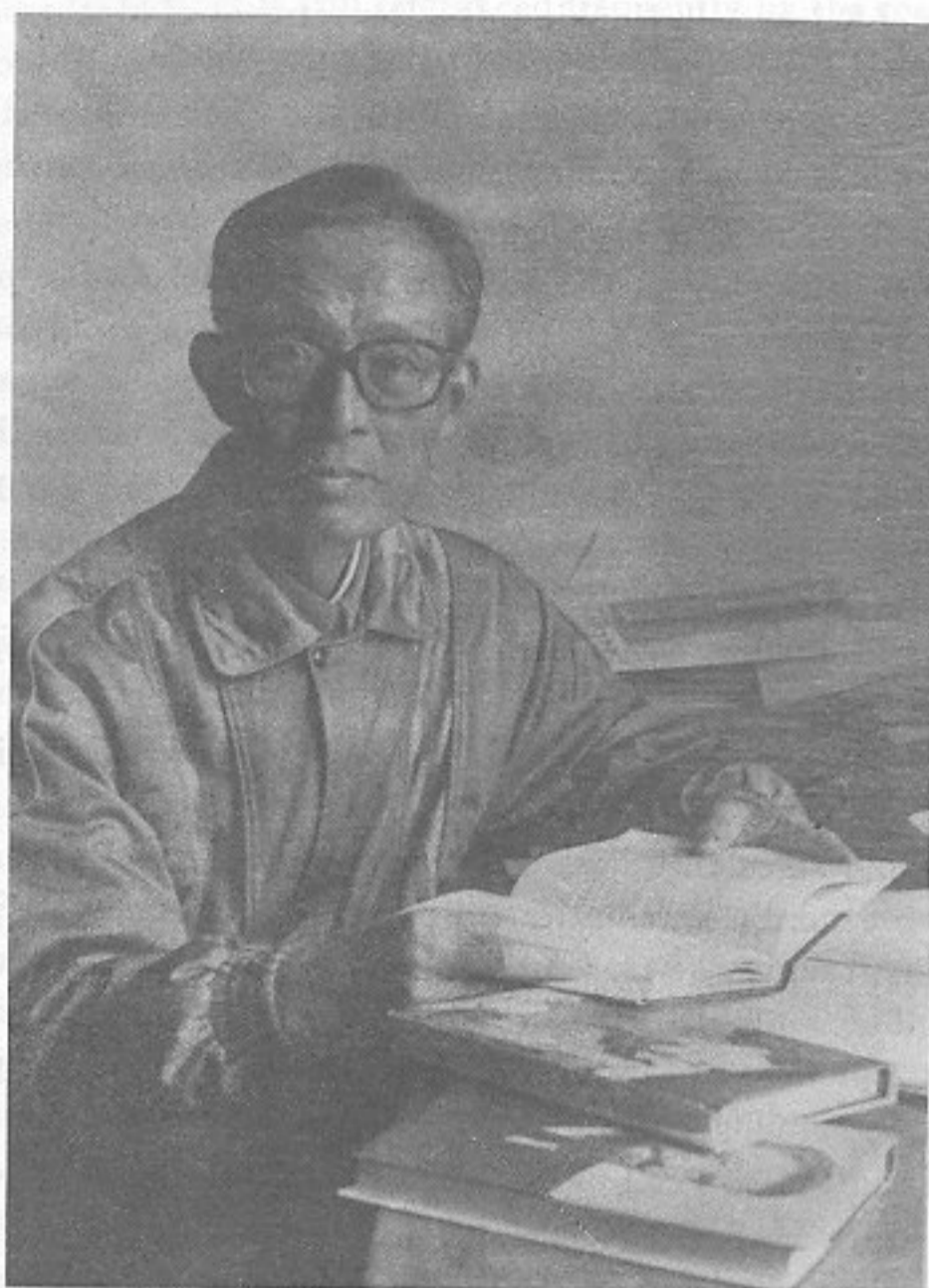


HAPPY BIRTHDAY, PROFESSOR ZHOU YULIN



Professor Zhou Yulin

February 12, 1993 is the 70th birthday of Professor Zhou Yulin, an outstanding mathematician, Member of the Chinese Academy of Sciences. We extend here our sincere congratulations to him.

Professor Zhou Yulin was born in Shanghai, with the ancestral home in Zhenhai, Zhejiang Province. As early as he studied in middle school, he had favored mathematics, especially plane geometry, and discovered the recurrence theorems. The simplest case of these results was published (in Chinese) on *Bulletin of Mathematics* later. This preliminary showed his talent in mathematics.

In September, 1941, he entered the Department of Mathematics at Datong University in Shanghai, where he received his B.S. degree in 1945. Besides his major subjects, he studied all the courses on physics (theory and experiments); all these played an important role in his later remarkable achievements in partial differential equations and

computational mathematics, etc.

Since 1946, he had been working for the Institute of Mathematics in the Chinese Central Academy of Sciences in Nanking, the Department of Mathematics at Tsinghua University in Beijing and the Department of Mathematics and Mechanics at Peking University, one after another. During this period, he had the opportunity to do some research work on manifold and topology under the guidance of Professor S.S.Chern.

From 1954 to 1957, he was a postgraduate student of the Department of Mathematics at Moscow University in U.S.S.R., to study the theory of partial differential equations, under the supervision of Professor O.A. Oleinik, a world-famous mathematician. Due to his excellent research work on quasilinear parabolic equations, he received a Candidate doctor's degree of physical and mathematical sciences there in 1957.

From Aug. 1957 when he returned to homeland to April 1960, Professor Zhou worked in the Department of Mathematics and Mechanics at Peking University, where he was the associate director of the Teaching and Research Section of Partial Differential Equation. Later he served as a vice chairman of the Institute of Applied Physics and Computational Mathematics.

Professor Zhou started academic career from studying combinatorial topology in the late 40's. He had published several papers covering the theory of homotopy, topological invariant of manifold since then, and achieved a series of excellent results. In 1957, he gave a course on nonlinear elliptic and parabolic equations at Peking University, organized seminars, taught the method of *a priori* estimates and researched the basic framework of nonlinear problems. This is a landmark in the PDE research in China. Professor Zhou is a pioneer and founder of the research on nonlinear partial differential equations, especially nonlinear elliptic and parabolic equations in our country.

His main work in the 50's can be classified into the following three aspects:

1) The joint work with O. A. Oleinik and A. C. Kalashnikov on porous media equation^[11], which was considered to be the foundation work on quasilinear degenerate parabolic equations. This paper not only gave the definition of the weak solutions, proved the existence and uniqueness of weak solutions for the Cauchy problem, Dirichlet and Neumann boundary value problems respectively, but also deeply revealed the important properties of solutions to this kind of equations, such as the finite propagation speed of disturbance, etc. For a longtime large amount of research work in this field has been conducted within the framework of this paper all around the world. This paper is still being referenced nowadays, thirty years later.

2) The research work on the existence of global solutions of Neumann boundary value problems for quasilinear parabolic equations of second order, which is the main part of his dissertation^{[12][19]}. As is well known, in the early 50's, the studies on general linear parabolic equations of second order had just begun. The only results on quasilinear equations were mostly concerned with the existence of local solutions; the research on the Neumann boundary value problems, even on the linear equations, had hardly ever been conducted. Professor Zhou creatively chose a proper research framework—the Rothe's method, in this dissertation, where he ingeniously gave a method of a

priori estimates for the derivatives of solutions and constructed the auxiliary functions featuring the nature of the problem. By this way, he successfully proved the existence of the global solution. This paper is still referenced frequently by the researchers studying the boundary value problems for nonlinear parabolic equations, at home and abroad.

3) The research work extends the classical results about the linear degenerate elliptic equations of second order in plane obtained by U.S.S.R. mathematician M.V.Keldish to quasilinear equations^[15]. The condition on the nonlinear terms assumed in [15] is natural and nearly sharp. This work has greatly influenced the PDE researchers in China and a quite lot of new results have been obtained since then.

Since late 70's, Professor Zhou has done a lot of excellent research work on nonlinear evolution equations and systems, including equations of nonlinear Schrödinger type, Sine-Gordon type, Korteweg-de Vries type, Sobolev-Gal'pern type, pseudo-hyperbolic and nonlinear wave systems, the water wave equations of Benjamin-One type and Joseph type, and their generalizations; and various kinds of coupled systems, etc. He has studied the global existence, uniqueness, blow up, asymptotic behavior, etc. of solutions for these equations and systems. The said results especially the various results about global solutions for strongly degenerate and strongly coupled nonlinear systems of ferro-magnetic chain (Landau-Lifshitz type) are highly valued at home and abroad.

Finite difference methods are of universal applicability to the numerical computations for all types of nonlinear partial differential equations. Professor Zhou established the interpolation relations between the classes of discrete functions in the sense of norms, studied the finite difference schemes for various nonlinear evolution partial differential equations and, for many commonly used difference schemes, studied their basic properties such as the relative and absolute convergence and stability. It is Professor Zhou who makes the theoretical study of finite difference method form a new direction. These results are included in one of his monographs^[70].

To meet the demands of large-scale scientific computations, Professor Zhou analysed the mechanism of the accumulation process of round-off errors, deduced the compatible relations between the main performance indicators such as speed, memory and word length, etc., thus provided a basis for efficiently designing and using super computers.

Since 1960, Professor Zhou had once been doing theoretical research work on developing nuclear weapon in the Ministry of Nuclear Industry, where he was responsible for the work on fluid dynamics and numerical computations. He had made great contributions to the successful study and manufacture of the first atom bomb, the breakthrough in the principle of hydrogen bomb and the theoretical design of strategic weapons in China. It can be said that the achievement on numerical simulation in the studying of atom bomb and hydrogen bomb is inseparable from his researches and direction. Especially he studied systematically the numerical methods for one- and two-dimensional fluid dynamics and some physical equations, from theoretical analysis to mechanical and physical images. By way of analysing in detail the interaction of waves in the motion of fluids and the structure of the solutions for Riemann problem, he developed and enriched R.Courant's and K.O.Friedrichs's original results (for detail, see [69]).

During the same period, he also proposed many concrete computational methods of practical values. Thus it can be said that Professor Zhou has played an important role in organizing a group of researchers in computational mathematics to serve the most advanced science courses of national defence.

Since 1978, Professor Zhou has been a vice president, the president of the Chinese Society of Computational Mathematics, an advisor of Chinese Society of Computational Physics, associate editor in chief or executive editor or advisor of "Computational Mathematics", "Journal of Computational Mathematics", "Numerical Methods and Computer Applications", "Annual of Mathematics" and "Partial Differential Equations" etc. Professor Zhou is also a professor at Peking University, Tsinghua University, Xiaman University, and an honorary professor at Henan University and Yunnan University.

Professor Zhou's research results about the theory and numerical solutions of non-linear partial differential equations are widely concerned and appreciated abroad. The famous journals of remarks on mathematics-Math. Rev., and Zent. für Math. have published tens of remarking articles to duly assert and praise Professor Zhou's work. He has been also invited to be a mathematics commentator for Zent. für Math. Owing to his academic achievement and leadership, his name was included in "Men and Women in the World", compiled by Cambridge International Biography Center. In addition he was invited to be one of its editors of the book Vol.8 (1990).

As a main researcher, Professor Zhou was awarded the first class prize of National Natural Science Prizes in 1982, an outstanding prize of National Science and Technology Progress Prizes in 1985 and the third class prize of National Natural Science Prizes in 1987.

Professor Zhou has long been working in the Department of Mathematics at Peking University and Institute of Applied Physics and Computational Mathematics, where he directed and trained many qualified scientific researchers, many of them are now noted scholars and academic leaders in universities and institutes. In a word, Professor Zhou has made great contributions to the development of the mathematical science in our country.

In moral character, Professor Zhou is a man of integrity, amiable and easy to approach, meticulous in scholarship, bold in making innovations and never satisfied with what has been done.

Now in spite of his old age, Professor Zhou is still working hard to make new achievements, to train young professionals. We, as his students and colleagues, sincerely wish him good health and a long life, and new great achievements.

Guo Boling, Jiang Lishang, Sun Hesheng, Ye Qixiao

List of Publications

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