

# The Shaw Prize Lecture in Mathematical Sciences 2008

■ Xin Zhouping



Prof. Ludwig Faddeev

The Shaw Prize in Mathematical Sciences 2008 was shared by Professor Vladimir Arnold and Professor Ludwig Faddeev for their fundamental and wide spread contributions to Mathematical Physics. The Shaw Prize Lecture by these two Laureates was hosted by Shaw College on 10 September 2008, which was well received by more than 500 colleagues and students from various institutions the public in Hong Kong. Each Laureate presented in about half an hour their views and perspectives on Mathematical Sciences, Mathematical Physics, and the natural roles played by mathematics in sciences in general. A question-and-answer session then followed. Contrary to the common belief that such high level mathematical talks could be very abstracted and difficult to understand for a general audience, the lectures are very educational, inspiring, lively, and interesting for most of the students in the audience.

Professor Arnold is one of the world's most prolific mathematicians, who has made fundamental contributions in numerous areas of mathematics including dynamical

cryptography. He emphasized the experimental aspects of his studies of chaotic behavior of mathematical objects. He argued strongly against the common opinion that mathematics is a chain of deductive reasonings, leading from one well established fact to the other. Instead, a good mathematician has to use hundreds of examples, hints, conjectures, rather than the rigorous deductions, to obtain any new knowledge.

In the lecture named "What is Quantum Mathematical Physics", Professor Faddeev describes the evolution of the term "Mathematical Physics" and relations between Mathematical Physics and Theoretical Physics by some examples from his own scientific life. MP used to be mathematical methods for theoretical physics. However, the advent of Quantum Mechanics led a completely new content for the MP, the quantum MP, where functional analysis (especially spectrum theory), Lie groups, modern algebraic topology and geometric ideas became an essential tool. Professor Faddeev stated that although the goals of Theoretical Physics and MP are essentially the same, yet the methodological aspects are rather different. As a founder of the Quantum Mathematical Physics, Professor Faddeev may be the most qualified speaker for this topic. It is very interesting to me to hear from Professor Faddeev the role of mathematics played in his successful scientific life!

There were many interesting ideas in both lectures. One common theme is that the goal of mathematical physics is not only to prove theorems about the results known to physicists, but rather to use mathematical intuitions and powers to get new results, still unknown to physicists. This should be true for all other branches of applied mathematics.

*Professor Xin Zhouping is the Associate Director of the Institute of Mathematical Sciences, the Chinese University of Hong Kong. He was the moderator at the Lecture.*



( From left ) : Prof. Liu Pak-wai, Prof. Vladimir Arnold, Prof. Ludwig Faddeev, Prof. Joseph Sung and Prof. Xin Zhouping

system theory, classical and celestial mechanics, singularity theory, topology, algebraic geometry, differential geometry, hydro-dynamics, mathematical physics, and combinatorial theory. Many of his results have important applications in other branches of sciences. He is wildly admired by his ability to discover the natural interrelations between very different subjects. In his lecture titled "Mathematics of Chaos", Professor Arnold illustrated through simple and concrete examples how to naturally relate the randomness of a sequence of numbers to the ergodic theory in dynamical systems, number theory, combinatorics, and