

MATHEMATICIAN YURI KONDRATIEV

Today, Yuri Kondratiev is one of the most highly cited Ukrainian mathematicians.

Born on 23 October, 1953, in Kyiv, he finished the Kyiv School of Physics and Mathematics No.145 and graduated cum laude from the Taras Shevchenko National University of Kyiv.

Aged 33, Kondratiev became a doctor of physical and mathematical sciences.

In 1990, he received the Alexander von Humboldt Foundation fellowship, Germany. Ever since, he combined his work abroad with his scientific activities in Ukraine.

In 1996, Yuri Kondratiev won the State Prize of Ukraine for science and technology.

In 2000, he obtained a professorship in Germany.

In 2006, he headed the Department of Applied Mathematics at the University of Reading (the UK).

In 2008, he was appointed Full Professor at the Bielefeld University (Germany).

Yuri Kondratiev, an organiser and participant of numerous international projects and conferences, was often invited to deliver lectures at universities in Europe, USA, China, Japan.

Professor Kondratiev’s interests span a wide range of scientific pursuits covering mathematical analysis, mathematical physics, probability theory, infinite-dimensional analysis, studies of complex dynamic systems, stochastic analysis, and spatial combinatorics.

In the second half of the 20th century, theoretical physicists “would engage themselves in mathematics”. That was understandable: by using mathematical methods, they wanted to prove or disprove physical hypotheses, explain and analyse experimental data, and produce reasonable forecasts. More rarely “pure mathematicians” would become converts to physics and other natural sciences. To one extent or another, a question of philosophy lay behind it — the relationship between mathematics and reality.

Kondratiev’s interest in mathematical physics was largely shaped owing to his collaboration with renowned schools of mathematicians R.L. Dobrushin, R.A. Minlos, Ya. G. Sinai and A.V. Skorokhod. Kondratiev also benefited from his association with I. M. Gelfand. He always refers to these mathematicians as his teachers.

His ability to grasp the essence of physical phenomena played its role as Kondratiev got familiar with works by S.V. Adamenko, a Ukrainian engineer-physicist, supervisor of the scientific-research Electrodynamics Laboratory “Proton 21”. In early 2003, he got personally acquainted with S.V. Adamenko and his works dedicated to nuclear fusion. At that time, a number of academicians representing the Physics Department at Ukraine’s National Academy of Sciences regarded Adamenko’s research as speculation, since it was indicative of some phenomena in nature that were considered impossible from the standpoint of classical physics. However, Kondratiev’s scientific intuition suggested that those studies were very important for science.

He shared the research results with physicists at the University of Bari (Italy), and its professor F. Selleri assisted in publishing a monograph on the Ukrainian physicist’s findings with Springer, a prestigious publishing house. In 2007, “Controlled Nucleosynthesis” (S.V. Adamenko, F. Selleri, A van der Merwe Editors) was released in Berlin. In the years that followed, Kondratiev took an active part in discussing issues related to self-organisation processes that occur during a nuclear fusion.

While studying complex dynamic systems in various fields, Kondratiev assumed, when scientists could discover laws applicable to a wide range of different complex systems, it would be possible to learn fundamental laws of the world order. Hence the need for interdisciplinary research on complex systems.

In 2009, Yuri Kondratiev and his colleagues from U.K. organized workshop “Stochastic Population Dynamics and Application in Spatial Ecology” (ICMS, Edinburg). In parallel, Kondratiev began to organize the scientific semester “Stochastic Dynamics. Mathematical Theory and Applications” in the Center of interdisciplinary research ZIF, University Bielefeld. The motto of this semester, he proposed to take I. Gelfand’s quote: “Mathematical language helps to organize a lot of things”.

In 2009, Yuri Kondratiev also came up with a proposal to set up a Centre for interdisciplinary studies of complex systems in Ukraine. V.P. An-drushchenko, Rector of the Dragomanov National Pedagogical University, and G.I. Volynka, Vice-Rector for Science, enthusiastically supported the idea. In 2010, the Centre was founded and Professor Kondratiev became its director, with a subsequent launch of the magazine “Interdisciplinary Studies of Complex Systems” in 2012.

Famous European scientists’ works in mathematics, physics, cosmology, education, philosophy etc. appeared on pages of the magazine in the past seven years. Important scientific issues of our time were examined from the standpoint of various sciences. A potent example of interdisciplinary research is “Stochastik Models of Tumour Development and Related Mesoscopic Equations (Issue No. 7, 2015)—a pioneering work by six authors from universities in the UK, Germany, Poland and Ukraine. This work combines motivations from biology and medicine spheres with mathematical methods of the complex systems theory. For this kind of work, the magazine operates as a forum that unities researchers coming from various branches of science.

Over time, Yuri Kondratiev expressed a keen interest in the application of mathematics to biology and the construction of mathematical models in

biology and ecology. He got acquainted with scientific works by V.I. Vernadsky, an outstanding scientist of the twentieth century, the first President of the Ukrainian Academy of Sciences. Above all, Vernadsky is widely known as the author of works on the Biosphere and its transition to the Noösphere. It is a little-known fact though that Vernadsky introduced a number into biology, which made it possible to speak about biology processes in terms of quantity.

Discovery of the laws of dissipation made Vernadsky address mathematicians with a question about a possible mathematical way to describe the “left” and “right”. In addition, Vernadsky introduced the concepts of biological space and biological time into biology. When studying mathematical models in biology, Kondratiev arrived at a conclusion that these models should exploit not Newton’s absolute time, but Vernadsky’s biological time.

In his book “Harvests and Seeds”, French mathematician Grothendieck writes that mathematics can be compared to a city and most mathematicians tend to “live in houses that have already been built”. They make repairs, purchase furniture and rearrange interior. Less frequently mathematicians create their own space and build a new house.

Mathematician Yuri Kondratiev does erect his own house.

There is a term in mathematics — “Kondratiev space”. To some of the scientist’s colleagues and close friends, the term has a more general meaning — it symbolises all his ideas, mathematical interests, scientific paradigm as a whole.

On the anniversary, the scientist was presented with the essay “Models and Adeles” dedicated to him — in recent years, Kondratiev has been actively exploring p-Adic numbers and Adeles. He shares the opinion of Yu. I. Manin who says that “at the fundamental level, our world is neither real nor p-adic: it is adelic... We usually project an adelic image into the material side. We might as well spiritually project its non-Archimedean side and arithmetically calculate the most important things...

“Material” and “arithmetic” pictures of the world constitute a relation of complementarity, resembling the relation between the conjugate observables in quantum mechanics.” Kondratiev says that the adelic picture of the world can be represented as a butterfly. But it is the butterfly that most often depicts the quantum conjugacy, the quantum entanglement of the “left” and the “right”. With the Biosphere transiting to the Noösphere, the adelic world will probably play an ever-increasing role.

Interdisciplinarity is apparent in Yuri Kondratiev’s entire personality — he is interested in poetry, questions of history and philosophy, he is concerned about today’s education problems. And the scientist, mathematician — Yuri Kondratiev — stands behind all this.