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LAUDATIO*

Mathematics like poetry” – such was the title of the interview with Professor Andrzej Lasota, published in the monthly magazine’s *Przegląd Powszechny* (June 1998). Our Venerable Doctorand says there: “I am really amazed by the fact that my view of mathematics is quite similar to the view of Miłosz on poetry. I believe that good mathematics is the reflection of the world, reflection of reality. It is the search of mathematical structure in the world.”

At the Jagiellonian University he started in physics. He loves it to this day, but after two years he decided to move to mathematics. The reason for such decision was the personality of an outstanding mathematician Professor Tadeusz Ważewski (1896–1972), lecturing mathematical analysis to the students of physics at the Jagiellonian University. His extraordinary mettle let him gather most prominently creative minds and perfectly shape them. Five of his students have later become the members of the Polish Academy of Sciences. This is how Professor Lasota recalls him: “Ważewski was not only an outstanding mathematician, university teacher and an organizer of scientific activities. He also possessed a rare gift. From the very first meeting one was falling under his spell. He was an extremely, almost overly precise mathematician, but nonetheless he was never confused with the details. He appreciated the true beauty of mathematics – its physical and biological sense. He was able to convince everyone that mathematics is necessary, that one can – without any hesitation – dedicate his life to it. He was able to show – as no-one other – how mathematics is created.”

And so, Andrzej Lasota became a mathematician – one of those who are looking for reflections of reality in mathematics. In 1960, he presented his Ph.D. dissertation in Mathematical Institute of Polish Academy of Sciences. The supervisor of the dissertation – titled *On a Limit Problem for the Vibrating String Equation* – was, obviously, Professor Ważewski. Four years later Andrzej Lasota received his habilitation at the Faculty of Mathematics, Physics and Chemistry of the Jagiellonian University, presenting

*The speech in Polish was published in *Andrzej Lasota. Doctor honoris causa Universitatis Silesiensis* (Katowice: Wydawnictwo Uniwersytetu Śląskiego, 2001).

a treatise *On the Existence and Uniqueness of Solutions of Nonlinear Differential and Integral Equations*. The theory of differential equations – the field he was introduced to by his master and very closely connected to physics – is Professor Lasota’s field of research up to this day. In this domain we owe him, among others, the following results:

- he described the relation between existence and uniqueness of solutions of nonlinear ordinary and partial differential equations and integral equations (jointly with Shui-Nee Chow, Zdzisław Opial, James A. Yorke);
- he proved that in Banach spaces the existence of solutions of ordinary differential equations with a continuous right-hand side is a typical property (in a topological sense) (jointly with James A. Yorke);
- he obtained the implicit functions theorem formulated for nondifferentiable functions and applied it in the proofs of existence of solutions for boundary value problems and periodic solutions of ordinary differential equations (jointly with Shui-Nee Chow).

Each domain of mathematics our Venerable Doctorand worked on was enriched with his valuable results. He solved Ulam’s problem, presenting the proof (together with James A. Yorke) of existence of invariant measure for certain piecewise monotone transformations. In the theory of nonlinear operators Professor Lasota obtained an analogy of Fredholm alternative. In the theory of Markov operators he discovered a technique of lower bound function, which proved to be a powerful tool for studying the stability of operators acting on densities. While studying an asymptotic stability of Markov operators acting on measures, he observed – together with Józef Myjak – a new class of sets, now called the *semifractals*.

Professor Lasota laboriously searched for *mathematical structure in the world*, together with physicists, engineers, physicians. A spectacular example of such interdisciplinary accomplishment of Professor Lasota is a model – constructed in co-operation with Docent Maria Ważewska-Czyżewska (from Medical University in Cracow) – describing the process of blood cells reproduction. It is given in the form of a differential equation with delayed argument. Applying solutions of that equation to the actual therapies, Docent Ważewska considerably helped the patients with drug-induced anemia. Medical Sciences Division of the Polish Academy of Sciences granted Andrzej Lasota and Maria Ważewska-Czyżewska a collective award of the 1st degree for the year 1977.

Mathematical problems of the theory of the cell cycle were Venerable Doctorand's passion till the mid-1990s. Studies of models of cell proliferation and differentiation were pursued by the Department of Biomathematics of the University of Silesia he was Head of, collaboratively with the Center of Nonlinear Dynamics of the Institute of Physiology of McGill University in Montreal, directed by Professor Michael C. Mackey. The cooperation of Professor Lasota and Professor Mackey resulted also in a joint monograph – authors dedicated it to the memory of Maria Ważewska-Czyżewska. First edition of that monograph, entitled *Probabilistic Properties of Deterministic Systems* was published by Cambridge University Press in 1985. The second version, extended and supplied with new results, was published by Springer-Verlag in the prestigious series “Applied Mathematical Sciences.” Its title is *Chaos, Fractals, and Noise: Stochastic Aspects of Dynamics*. This outstanding book – as it was praised in *Mathematical Reviews* – demonstrates to the scientists of diverse fields how to investigate nonlinear dynamic systems, using the theory of linear operators and probability theory.

Nonlinear dynamics is a theory of how objects, devices and systems evolve in time. It plays a central role in potentially any area. That approach of Professor Andrzej Lasota to probabilistic treatment of dynamic systems Professor Yorke called *revolutionary* in his review. Such method – as Professor Yorke reminds – was adopted by the Berkeley school of dynamics and became one of the foundations of nonlinear dynamics.

Mathematics describes the world mainly with use of two of its branches: the theory of dynamical systems and differential equations, as well as probability theory and statistics. While creating pure mathematics lying at the border between these two branches, Professor Andrzej Lasota teaches us how to look at the world – states Professor Yorke.

“And the mathematics created by our Venerable Doctorand is of highest grade. His achievements are profound and exceptionally original” – as we can read in Professor Łojasiewicz's review. Professor Lasota's inspirational role for the whole community he works within was stressed by Professor Olech in his review. Professor Olech also noted that at least two foreign mathematicians, professors of prestigious universities, consider themselves the apprentices of Venerable Doctorand. He has promoted twenty doctors of mathematical sciences. Half of them has already received their habilitations, four – the title of a professor. “Enthusiasm is infectious.” How much of his enthusiasm infected us, Silesian mathematicians! Therefore, with great pleasure, I read the traditional academic phrase, being the conclusion of the Laudatio:

In recognition of your merits and achievements the Illustrious Senate of the University of Silesia in Katowice, in an unappealable resolution of May 22, 2001, decreed to grant and award you, the Venerable Doctorand, the title of doctor honoris causa of the University of Silesia.