Verebeichik: In Memoriam

This issue is devoted to the memory of Iosif Yakovlevich (I. Ya.) Verebeichik, a talented mathematics teacher who helped to raise several generations of mathematicians and scientists.

I. Ya. Verebeichik was born on March 23, 1921, in an ancient Russian city of Yaroslavl. In 1931, his family moved to St. Petersburg (then Leningrad) where he lived since then. After finishing high school in 1938, he started his study at the Leningrad Polytechnic Institute. In Summer 1941, when Nazi Germany attacked Soviet Union, I. Ya. joined the Soviet Army. The Nazi offensive was heroically stopped in the cold Winter of 1941. Millions died in the fierce battles; I. Ya. survived, but he was severely wounded and therefore discharged from the army. After recovering, I. Ya. entered the Pedagogical University and became a certified teacher of mathematics.

In 1952, during an anti-Semitic campaign launched by the Soviet dictator Joseph (Iosif) Stalin, he was fired from his job – together with all other Jews – and was preparing to leave into Siberian exile. Luckily, in 1953, Stalin died, and under the new, more tolerant leadership he was hired back. During the 1950s, he became one of the best teachers in St. Petersburg. He was demanding, passionate, and very successful: he enhanced the program by his new innovative ideas, and this helped his students to learn much more. In 1961, a special high school was organized in St. Petersburg, School No. 30 with a special emphasis on Physics and Mathematics, under the guidance of St. Petersburg University and its Department of Mathematics. As one of the best teachers, I. Ya. was invited to join this school. This is where we, the authors of this issue, met him. We were his students, he was our teacher.

He was not just a teacher of mathematics, he was a teacher of life, a real guru. Having survived the brutal war, he was not afraid of the oppressive communist dictatorship, he told us the truth and he helped us see the truth untainted by the official propaganda lies. Later on, we learned that he was constantly threatened and reprimanded – but at that time, our school felt like a piece of a free world, where we could talk freely, where it did not matter whether you are Jewish or belong to other officially persecuted minority, where our only kings were Truth and Mathematics.

He was an unbelievably successful teacher. Many of his students became professional mathematicians, and those who went into other areas like engineering, computer science, physics – retained a deep love of mathematics and of its tools.

We all loved him. Every year, on March 23, no matter how much time passed since our graduation, we would go to his apartment, serenade him, and celebrate his birthday. Sometimes he would get sick but then he would magically recover and remain as full of energy as usual. This year, in 2007, we did not come to celebrate his birthday: he died in early March. This issue is our serenade, a serenade that we did not have a chance to sing.

There will be more. His memory is with us. We love you, Iosif Yakovlevich.

Different Aspects of Uncertainty: Preface to the Special Issue

One of the main objectives of science and engineering is to change the world, to make the world a better place. To be able to make these changes, we empirically study the world's phenomena, to learn how different changes will affect the values of the world's parameters. To the resulting empirical data, we apply data processing techniques; we also use experts to make conclusions about the corresponding phenomena. Based on the empirical dependencies and expert knowledge, we make a decision – e.g., what control to apply.

For example, if we want to design a bridge, we first study how different loads will affect the stability of different constructions. In addition to the corresponding mechanical equations, we also need to use the expertise of demographers and transportation engineers who will predict how the population of the region will grow in the nearest future, and how this growth will affect the traffic on the bridge. Based on this knowledge, we come up with a design, and then we build a bridge according to this design.

On every stage of this process, there is uncertainty. First, there is uncertainty in studying the phenomenon. Our objective is to predict the results of possible actions, but the consequences depend not only on our actions – they also depend on other factors. For example, the stability of the bridge depends not only on the traffic volume on this bridge, but also on the direction and strength of the wind.

Second, expert knowledge often comes with uncertainty. It is very rare when an expert can formulate his or her opinion in precise mathematical terms. At best, an expert can describe this opinion by using professional terms, terms like causality, randomness, etc., which are reasonably well established but still lack exact mathematical definitions. At worst, the expert uses "fuzzy" (vague) words from natural language like "small", "large", words which do not have any precise well-established meaning.

Finally, even when we determine the optimal design, the optimal control values, we usually cannot implement these values exactly; there is always some implementation inaccuracy and uncertainty. We must take this implementation uncertainty into consideration in the design process.

Papers presented in this special issue provide examples of all these types of uncertainty. The first paper, by K. Hamza and F. Klebaner, illustrates the uncertainty and unpredictability of a real-life phenomena – specifically, the uncertainty of financial markets. Uncertainty related to the possibility of different interpretation of professional terms like "random" and "typical" is discussed in the second paper – by V. Kreinovich. In this paper, the professional terms are illustrated on examples from physics. Uncertainty of natural language is investigated in the paper by A. Israeli; this paper is the closest in topic to fuzzy logic – a frequent subject of this journal – but, in contrast to typical fuzzy logic papers, it deals with these problems from a more linguistic perspective. Finally, the uncertainty of implementation is discussed in a paper by A. Axelevitch, on the example of an important engineering process of film deposition.

Examples presented in these papers illustrate the range of possible applications of uncertainty: from fundamental physics to engineering (like film deposition) to social phenomena (like financial markets).

This issue combines different aspects and different applications of uncertainty. The authors tried their best to make sure that all the papers are understandable to the general readership of this journal, beyond the corresponding narrow professional group of engineers, financial specialists, etc. The anonymous referees, in their turn, did their best not only to check correctness and novelty of the papers, but also to make sure that all these papers are indeed clear and understandable for a general uncertainty-interested audience. To all the authors, to all the referees, our deep thanks.

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