





Professor Henryk Woźniakowski

Professor Henryk Woźniakowski is a world-renowned expert and an undisputed authority in computational mathematics. This field, which connects mathematics and computer science, has numerous applications in those disciplines of science and technology which require complicated and time consuming calculations. In his extraordinarily prolific academic career, he has published four monographs and around 200 articles. In the scientific world he is known primarily as a co-founder and propagator of information-based complexity, IBC, and tractability studies for multivariate problems, which often suffer from the so-called curse of dimensionality.

Born in 1946, Professor Woźniakowski was not only a witness, but also an active participant in the important events in the post-war history of Poland, including the period of Solidarity and the regime change occurring at the end of the eighties and the beginning the nineties. His academic life has primarily been based at the University of Warsaw, where he has studied and worked since 1969. At the same time, he is (now retired) full professor at Columbia University in New York. In the difficult years of 1981–1984 he was dean of the Faculty of Mathematics, Informatics and Mechanics, and in 1989–1991 he was the chair of Solidarity at the University of Warsaw. Henryk Woźniakowski's involvement in the independence movement was the reason for the delay of the title of Professor, which came only in 1988.

At the beginning of his career, Professor Woźniakowski focused on issues in classical numerical analysis. His research resulted in a speedy PhD degree in 1972 and habilitation in 1976. Later, he began to develop a general theory of computational complexity of mathematical problems. His first monographs, *A General Theory of Optimal Algorithms* (with J.F. Traub, Academic Press, 1980) and *Information, Uncertainty, Complexity* (with J.F. Traub and G.W. Wasilkowski, Addison-Wesley, 1983) have become a turning point in the development of the whole theory, and another monograph, *Information-Based Complexity* (with J.F. Traub and G. Wasilkowski, Academic Press, 1988) developed the theory and consolidated its name.

For the last twenty years, Professor Woźniakowski has been working specifically on computational complexity of problems whose solutions depend on large and even infinite number of variables. Although such problems appear regularly in modeling real phenomena, finding their numerical solutions is often very difficult computationally. Due to the curse of dimensionality, it is practically impossible to find even approximate solutions in traditional computational models and using traditional methods, because the time cost increases exponentially fast as the number of variables increases.

The difficulties related to finding numerical solutions to these problems have been known for at least half a century. But for a long time, the mathematical formalism capturing the essence of things had been missing, and the curse of dimensionality had been functioning without a precise definition. On the other hand, due to the rapid development of computers and increasing complexity of theoretical models describing continuous phenomena, there was a need to answer the question whether there exist effective algorithms for solving high dimensional problems, and if so – what are they? When and how can the curse of dimensionality be broken is one of the main questions of contemporary computational mathematics.

It was not until the pioneering work of Professor Woźniakowski since the nineties of the last century that research on this subject has been launched in earnest. At the time, Woźniakowski

observed the relation of multivariate numerical integration in the average case setting with discrepancy in the L_2 norm, which was met with great recognition. These and his other results have found applications in solving many computational problems, especially in financial mathematics. Other researchers joined this new field of research, which quickly led to the development of a currently trendy theory of tractability, a part of IBC. The crowning of research on this topic is a three-volume monograph by E. Novak from Friedrich Schiller University Jena and H. Woźniakowski, *Tractability of Multivariate Problems*, published by the European Mathematical Society in 2008, 2010 and 2012. The results included in this monograph, among others, were the reason for Professor Woźniakowski being awarded the main Stefan Banach Prize by the Polish Mathematical Society in 2013.

Professor Woźniakowski also received two first-degree prizes from the Minister of National Education, the Stanisław Mazur Prize from the Polish Mathematical Society, two awards from the Polish Academy of Sciences, the prestigious scientific award of the Alexander von Humboldt Foundation, and honorary doctorates from the Friedrich Schiller University in Jena in 2008, and Cardinal Stefan Wyszyński University in Warsaw in 2016. He is also a correspondent member of the Polish Academy of Sciences. He regularly lectured at many famous centers all over the world, including Berkeley, Berlin (Weierstrass Institut), Carnegie-Mellon, Cornell, Haifa (Technion), Hong Kong, Kaiserslautern, Los Alamos, Paris VI, Stanford, Sydney, Tokyo, Vienna, Yale.

Professor Woźniakowski's scientific work has had a huge impact on at least two generations of scientists who work on computational mathematics. Woźniakowski has infected many with his enthusiasm for mathematics. In the nineteen-eighties, Professor Woźniakowski created a strong research group in Poland, made up of researchers working on computational complexity of continuous problems, whose members are amongst the leading researchers in this field in the world. He supervised five PhD theses in Poland and seven abroad.

Professor Woźniakowski belongs to the founders of the *Journal of Complexity*, where he is now a senior editor. He is also

a member of editorial boards of several other mathematical journals.

In 2016, we celebrated the 70th birthday of Professor Woźniakowski at a specially organized conference: IBC on the 70th Anniversary of Henryk Woźniakowski. It took place in Będlewo near Poznań from August 29 to September 2 and gathered representatives from 34 institutions and 14 countries around the world.

In this interview, which was completed at the end of year 2016, we ask Professor Henryk Woźniakowski many questions about the various aspects of his rich life. The answers let the reader get a feel not only for its scientific aspects, but also the issues of life and politics in Poland over the past several decades.

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Bolesław Kacewicz
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