

# Preface

This book contains five contributions on the complexity of continuous problems and, at the same time, is a Festschrift for Henryk Woźniakowski.

A version of these contributions (except for the last one) were presented on June 6, 2008, at the Friedrich Schiller University in Jena, when Henryk was presented with an honorary doctoral degree by the University of Jena. It was for us a very happy occasion, and it was an occasion for talks addressed to a wider audience. We believe that these talks (and now papers) are a good introduction and supplement to more technical research papers and books.

We briefly describe the contents:

- The account “Henryk Woźniakowski and the complexity of continuous problems” by EN describes some of the achievements of Henryk, and it contains remarks about the history of information-based complexity (IBC). It also contains the reports from Mathematical Reviews about the two main monographs on IBC, the two black books that appeared 1980 and 1988, respectively. As an appendix, we list all publications of Henryk.
- The essay “Complexity as a new challenge for mathematicians” by HW discusses the computational complexity of three problems: matrix multiplication, multivariate integration of smooth periodic function, and multivariate approximation of smooth functions. The first two problems are studied in the worst case setting, whereas the third problem is studied in the average case setting with the folded Wiener sheet measure. These three problems serve as an illustration that computational complexity presents a new set of questions, whose answers often require new proof techniques. That is why even well studied mathematical problems need to be revisited when we want to find sharp bounds on their complexity.
- The section “A brief history of information-based complexity” by JFT relates how Henryk Woźniakowski first came to Carnegie Mellon University in 1973. It then flashes back to precursors of IBC as well as the beginning of optimal iteration theory. The rest of the essay is devoted to the history of IBC, from the early 70s and then follows IBC to the present.

- The section “How high is high-dimensional?” by IHS describes the fascinating history of high-dimensional integration. This field changed dramatically over the last 15 years, with much of that change driven by Henryk’s persistent question: ‘What happens to the error as the dimension goes to infinity?’.
- The purpose of the last essay “What is information-based complexity?” by HW is to introduce information-based complexity in an informal way. The basic notions of IBC for the approximate solution of continuous mathematically posed problems are described there.

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