The Jubilee of Professor *Jonas MOCKUS*

On June 18, 2001 the scientific society commemorates the 70th anniversary of Prof. Dr. habil. J. Mockus, a world renowned scientist, a real member of the Lithuanian Academy of Sciences. The Editorial Board of the journal *Informatica* and colleagues sincerely congratulate him and willingly introduce this outstanding scientist to the audience of the journal.

The very beginning. June 18, 1931. The Pakruojis township in the Rokiškis district. Lithuania. A boy was born here to the family of teachers Ona and Balys Mockus. The parents named him Jonas. Such is the very beginning of J. Mockus' life.

Education. In 1947 graduation from secondary school at Kaunas. From 1947 to 1952, the studies at the then Kaunas Polytechnical Institute, Faculty of Electrical Engineering, and a speciality of elelctrical engineering acquired. From 1952 to 1956 doctoral courses at Moscow, and his successful graduation from the Institute of Energetics of the USSR Academy of Sciences.

Scientific degrees and titles. In 1956, the thesis in technical sciences maintained at Moscow, Institute of Energetics, in 1966 – a doctoral thesis defended at the Institute of Automation and Computer Engineering in Riga, in 1968, a professor's title was conferred on him, and in 1992, a doctor habilius title in informatics engineering in the field of technological sciences was conferred.

Work at scientific institutions. In 1957, Jonas Mockus begins his career as a senior researcher of the Energetics Institute of the Lithuanian Academy of Sciences in Kaunas, and since 1959 he has been head of the Optimization Department. Since 1970 he has been working in Vilnius as head of the Optimization Department at the Institute of Physics and Mathematics (presently, Institute of Mathematics and Informatics).

Teaching at universities. Since 1959 Jonas Mockus has been a lecturer at the Kaunas Polytechnical Institute (presently, Kaunas University of Technology), and since 1968 – a professor of this university. From 1993 he is a professor of Vytautas Magnus University, and from 1995 – of Vilnius Gediminas Technical University.

Awards. In 1968 Jonas Mockus was awarded the State Prize of the Lithuanian SSR for the monograph *Multimodal Problems in Engineering Design* (Nauka, 1967). In 1970 he was elected a corresponding member of the Lithuanian Academy of sciences, in 1974 he became a real member of the same academy, and in 1998 he was given a Lithuanian Science Prize for the monographs: *Bayesian Approach to Global Optimization* (Kluwer Academic Publishers, 1989), and *Bayesian Heuristic Approach to Discrete and Global Optimization* (coauthors W. Eddy, G. Reklaitis, A. Mockus, L. Mockus, Kluwer Academic Publishers, 1997).

Edition of scientific publications. Jonas Mockus is editor-in-chief of the journal *Informatica* and a member of the editorial board of the *Journal of Global Optimization*.

Scientific organizations. Jonas Mockus is a member of the "American Mathematical Society" as well as the IFIP working group W.G.7.7 (Stochastic Optimization), and a member of Senate of the Institute of Informatics and Mathematics.

Contribution to science. The range of J. Mockus' scientific research embraces global and discrete optimization theory, methods, algorithms, software and its applications in design, economics, and statistics. He is the author of the global optimization theory based on the Bayesian approach. In this field Jonas Mockus gained a recognized authority in the scientific world. On the basis of this theory Jonas Mockus has constructed a number of algorithms for global and discrete optimization. The methods of discrete optimization developed by J. Mockus rely on an efficient use of heuristic and approximate algorithms. The key target of work was to solve a fundamental problem that is of importance to technical sciences: how to relate heuristics found by experts with the mathematical Bayesian solution theory. A potential domain of application of the work results in theory is very wide which is withessed by a list of different problems, investigated within the framework of one theory, and each of which features important problems in practice. On the whole, solution of this very important problem required a deep insight into manysided mathematical issues, however they were only a means for increasing the efficiency of the usage of optimization methods in technical and economic systems.

Traditional mathematical methods were created with a view to ensure the accuracy. Using the guaranteed precision methods in real engineering problems, the calculation time grows exponentially, therefore to optimize large and complex systems the heuristic methods are applied. The rules of solution based on expert experience and intuition are called heuristics. Heuristic methods consume less time, however, they are not substantiated by theory, so the efficiency of their application depends on the intuition of experts.

J. Mockus has shown in his works how to use the Bayesian statistical solution theory in order to optimize the parameters of heuristic methods by randomizing and joining different heuristics. This theoretical result facilitates the improvement of heuristic methods by ensuring the convergence and essentially diminishing their average error. This equally applies both to newly created heuristics and traditional widespread heuristic optimization methods, e.g., genetic and simulated annealing algorithms.

To verify the efficiency of theoretical results, J. Mockus has studied several different mathematical models that reflect important design and control problems. In chronological order, a first application of global optimization (not only in Lithuania, but also on the international scale) was the optimization of magnetic circuit parameters of a domestic electric meter. Jointly with the Vilnius Electric Meter Plant J. Mockus has constructed its model CO–1445 that ensured the required precision even using low quality magnetic substances. A second application was the optimization of the USSR North-West Electric Power Networks to order of "Energosetprojekt", when more reliable and more economical high-voltage networks of this system and also of Lithuania have been designed. The first monograph by J. Mockus *Multimodal Problems in Engineering Design* (Nauka, 1967) presents a detailed description of this and other examples.

Under the supervision of J. Mockus, a lot of different problems of practice that reflect essential optimization problems in various technical and economical systems have been considered. The latest application of significance is working out optimal schedules for serial production in small series. The work was done in conjunction with the chemical engineering department of Purdue University and Searl Research Laboratories of the

Biotechnological Company at Monsanto, USA. All this including new results in theory are described in his third monograph *Bayesian Heuristic Approach to Global and Discrete Optimization* (Kluwer, 1997). In addition, this monograph features a direct usage of the heuristic method by means of dynamic visualization that is fit for optimizing the search for images at the statistics department of Carnegie Mellon university by analyzing 30 000 pictures of Jupiter taken by the space station "Voyager". In his second monograph *Bayesian Approach to Global Optimization* (Kluwer, 1989) J. Mockus describes mathematical aspects of this theory, software of global optimization as well as a number of optimization applications in practice, starting from vibroengines and finishing with nonstationary queueing systems.

Program realizations of the optimization methods developed are included into many program packages. But for the Optimization department only, headed by him, many optimization packages have been developed following various scientific programs, dependent on the computer basis and the specificity of the problems solved. All of them bear a common feature that their user can find a wide range of optimization programs: not only for global optimization, but also for local search and structural analysis of problems.

In the latest J. Mockus' monograph – *A Set of Examples of Global and Discrete Optimization: Application of Bayesian Heuristic Approach* (Kluwer, 2000) – examples of global optimization meant for the studies and research work in the medium of Internet are described.

J. Mockus has prepared a generation of Lithuanian optimization specialists, most of whom are successfully proceeding in this field. Under his supervision, 18 PhD theses and 3 doctoral theses for habilitation have been maintained. J. Mockus is the author of over 100 publications including 4 monographs, as well as 87 scientific reports, 62 of which delivered at international conferences, and also he was an invited speaker and lecturer at 36 international conferences.

The subject area of J. Mockus' lectures at universities ranges within the framework of optimization methods, operations research, game theory, queuening theory, theory of statistical solutions, experiment design and reliability theory.

Coordination of teaching with scientific research work yields good results in preparing future specialists in informatics.

Family. J. Mockus is married. His wife Danguole Mockiene is engaged in scientific work too. They brought up two sons – Linas and Audris – who also have chosen a scientist's career (following in their father's foot steps) and presently are successfully working at scientific institutions of the USA, keeping close scientific contacts with the research work performed by J. Mockus. 7 grandchildren are growing safe and sound.

Leisure. All his life J. Mockus constantly went in for one or other kind of sports: skating at his early youth, swimming and yachting at older age, a longlasting slalom in the Caucasus mountains, and skiing and hiking in Lithuanian plains so far.

On behalf of the colleagues of the Institute of Mathematics and Informatics and Editorial Board of *Informatica*:

Elena Juškienė, Gintautas Dzemyda, Mifodijus Sapagovas, Vydūnas Šaltenis, Laimutis Telksnys, Vytautas Tiešis, Antanas Žilinskas.