

## Special Issue on “Dynamic Systems, Stability, Controllability, and Automatic Control”

Dedicated to Professor Henryk Gorecki



This special issue of the Bulletin of the Polish Academy of Sciences – Technical Sciences has a unique intention. It is a collection of papers dedicated to Professor Henryk Gorecki (see photo), the famous scientist and the founder of the Automatic Control Institute in the AGH University of Science and Technology (former name Academy of Mining and Metallurgy). For Professor's Gorecki 80<sup>th</sup> anniversary, a group of his students and friends wrote and put together this set of papers both as a tribute to the Professor and as a symbol of our gratitude.

As an alumnus and the successor of professor Gorecki – someone who has led his Institute for the last ten years – it is my great honour and pleasure to present the content of this volume. I would like recommend to you all the papers included in this issue while providing here few comments. The papers were selected to show their connection with the scientific and didactic ideas introduced and studied by Professor Gorecki. These ideas have now been researched by the authors – former students, co-workers, and certainly good friends of Professor Gorecki.

The primary area of Professor Gorecki's scientific research has been the theory of dynamic systems. The first chapter in

this issue is the paper written by professor W. Mitkowski entitled “Dynamical Properties of Metzler Systems” related to the similar works of Professor Gorecki. Analysis of dynamic systems has several viewpoints. However, one of the most important aspects of the analysis is discovery of the stability conditions. This special area of interest, evident in numerous scientific works by Professor Gorecki, is represented in this issue as a collection of four papers originated by the scientists from the Bialystok University of Technology. First and the most important in this section, is the paper by professor T. Kaczorek entitled “Practical Stability of Positive Fractional Discrete-time Linear Systems”. Next, let me recommend to you two papers by professor M. Busłowicz: “Stability of Linear Continuous-time Fractional Order Systems with Delays of the Retarded Type” and “Simple Stability Conditions for Linear Positive Discrete-time Systems with Delays”. Last but not least in this group is the paper written by doctor A. Ruszewski “Stability Regions of Closed Loop System with Time Delay Inertial Plant of Fractional Order and Fractional Order PI Controller”. This paper, however, originates from the theory of stability of dynamical systems, but leads to practical applications of the theory in industrial stabilization problems.

Stability of dynamic systems is closely related to the concept of the system controllability. This area of interest is represented by professor J. Klamka's paper entitled “Constrained Controllability of Semilinear Systems with Delayed Controls”. The paper is also related to yet another area of professor Gorecki scientific activities – the control of the dynamic systems with delays. The same area is represented in another paper entitled “Parallel Compensator Versus Smith Predictor for Control of the Plants with Delay” by professor R. Gessing. Selected problems of automatic control system are presented in papers “Applicational Possibilities of Nonparametric Estimation of Distribution Density for Control Engineering” and “Application of LMI for Design of Digital Control Systems” by professors P. Kulczycki and A. Krolikowski respectively.

Very special type of control problem is discussed by professor A. Świerniak in the paper “Direct and Indirect Control of Cancer Populations”. Let me express here my own gratitude to professor Gorecki, who since 1971 has actively supported the expansion of the biocybernetic group (including my own research) in his Institute, although he personally was not engaged in this particular subarea of cybernetic and system theory.

Operational Research was another subarea supported by professor Gorecki. The paper “Queuing Systems and Networks. Models and Applications” by professor B. Filipowicz represents in this issue such branch of scientific activity of the Automatic Control Institute personnel under supervision and scientific patronage of professor Gorecki.

Research work performed in the Automatic Control Institute has been always firmly grounded in the mathematics. Professor Gorecki himself was not only famous automatic control engineer and extremely creative scientist in the area of system science. He has been also an outstanding mathematician, a member of the American Mathematical Society. The Institute led by professor Gorecki was a launching point for several excellent mathematicians. An example is professor S. Bialas, who after work in professor Gorecki Institute, directed the Mathematical Institute, and became the first Dean of the Mathematical Faculty in the AGH University of Science and Technology. Therefore, it is no wonder that the article entitled “An Algorithm for the Calculation of the Minimal Polynomial” by professor Bialas is also included in the presented issue.

Not only scientific research, but also didactic activities were the area of great attention by Professor Gorecki. New methods of teaching have been always promoted and developed in the Automatic Control Institute. This area of activity is a subject of two final papers: “Dependable and Certifiable Real-world Systems – Issue of Software Engineering Education” and “Selected Problems Resulting from the Use of Internet for Teaching Purposes” written by professors A. Kornecki and R. Tadeusiewicz respectively.

Obviously, the presented issue cannot include all the possible papers dedicated by the students and co-workers as a tribute to professor Gorecki. I hope, however, the selection of papers presented below shows how rich and multifaceted are the fruits of professor Gorecki professional activities.



Ryszard Tadeusiewicz