FROM THE EDITOR

The Department of Hydraulic Engineering is proud to have been invited to prepare a special issue of TASK Quarterly, entitled "Computational Techniques in Hydraulic Engineering", devoted to the mathematical modeling of selected environmental problems. We welcome this opportunity to offer the journal's reader some insights into our current research work, with special emphasis on the use of computer methods in water resource management.

The Department of Hydraulic Engineering (DHE) is one of the twelve constitutive units of the Faculty of Civil and Environmental Engineering of the Gdansk University of Technology. Its scientific and research activities cover a wide range of subjects related to hydromechanics, hydraulics and hydrology, with a focus on the following two fields:

- investigation of water flow problems in natural systems (environmental hydraulics), and
- physical and mathematical modeling of sanitary and other hydraulic structures.

More specifically, the following topics are investigated:

- run-off from natural watersheds and urban areas,
- unsteady flow and flood routing in open channel networks,
- unsteady flow in shallow reservoirs,
- flow in porous media (including saturated and unsaturated soils),
- pollutant transport in rivers, reservoirs and groundwater,
- unsteady flow in pipe systems,
- dynamics of hydraulic systems in water power plants, water and waste-water treatment plants.

The aforementioned problems are described with a variety of mathematical formulations, including linear and non-linear algebraic equations, ordinary and partial differential equations and integral equations. Practical application of these mathematical models requires a computer-based approach. Thus, research on numerical methods constitutes an important part of t our department's scientific activity. The results achieved by the DHE staff have been published in many international and domestic journals.

This issue of TASK Quarterly contains eleven contributions closely related to the application of computer techniques in hydrology and hydraulics. They are authored by DHE researchers, our former PhD students and colleagues from other

institutions involved in common research projects. The largest group of papers concerns surface water flow, the topics including estimation of flood risk zones via numerical modeling (M. Szydłowski and A. Magnuszewski), two-dimensional flow in the vertical plane (P. Zima), mass balance errors in numerical solutions of flood routing models (D. Gąsiorowski), determination of parameters in a 1D channel flow (K. Weinerowska-Bords), and pollutant migration in a channel network (R. Szymkiewicz). Subsurface water flow is the subject of two articles, one concerning flow in unsaturated soils of complex structure (A. Szymkiewicz and K. Burzyński), the other – groundwater flow in aquifers (W. Szpakowski). Unsteady flow in pipes is discussed by K. Weinerowska-Bords. Two other papers concern flow in sanitary facilities: a bioreactor (P. Zima) and a filter (J. M. Sawicki and S. Bering). Finally, the role of digital maps in hydrology is presented in the contribution of W. Szpakowski and J. Szulwic.

We hope that the presented papers will familiarize the readers with problems of mathematical modeling of water resources.

Guest Editor
Romuald Szymkiewicz