Preface to Special Issue: Heat Transfer, Waves, and Vortex Phenomena in Two-Phase Flows

On May 30 2020, Academician Sergey Alekseenko, a world renowned researcher in heat transfer and fluid mechanics, celebrated his 70th birthday. The present two-part special issue of Interfacial Phenomena and Heat Transfer was prepared by his colleagues to mark the occasion. Over the course of his remarkable scientific career, Prof. Alekseenko made fundamental contributions to such diverse research areas as heat transfer and nonlinear waves in liquid films, flows of confined turbulent jets, vortex structures in swirling flows, and combustion with applications to environmentally friendly thermal power plants. His numerous honors include election to full membership of the Russian Academy of Sciences in 2016, and winning the Global Energy Prize in 2018. Scientists in Russia and abroad were introduced to new and rapidly developing areas of thermophysics and fluid mechanics through books he has co-authored, most notably the monograph on wave flow in liquid films. Prof. Alekseenko has held many leadership roles in the thermophysics community, including that of Director of the Kutateladze Institute of Thermophysics for over twenty years. A detailed biographical sketch prepared by N.A. Kupershtokh corresponds to the first article in the first part of the special issue, followed by the theoretical study of a confined liquid film in an inclined rectangular duct by Barmak et al. which resulted in novel interface stability criteria for different duct heights, aspect ratios, and viscosity/density ratios of the fluid phases. The topic of interfacial instabilities is also addressed in the context of non-isothermal systems by Davalos-Orozco. He has focused on Marangoni effects during thermal interaction of gravity-driven liquid films on two sides of a solid wall and used a combination of analytical and numerical techniques. Cherdantsev et al. conducted stability analysis of large-amplitude waves on the surface of gas-sheared film. Localized perturbations of the film surface at different locations are introduced to model the destabilizing effect of large-scale turbulent pulsations in the gas phase. This article concludes the first part of the special issue. The second part will be published in the next issue of Interfacial Phenomena and Heat Transfer (Issue 4, 2021). It will include studies of stability and weak interaction of two-dimensional solitary waves in falling liquid films conducted by Demekhin who also provides a fascinating historical perspective.

Detailed experimental studies are also included in the second part dealing with slug-flow boiling in pipes (Moran et al.) and twin vortex merging investigated by a laser-Doppler anemometer and particle image velocimetry (PIV) technique (Skripkin et al.) and with slug-flow boiling in pipes studied by a combination of PIV and an interface detection method (Moran et al.). Numerical solutions for temperature distributions in a liquid bridge in a gap between two heated cylinders are obtained by Geshev. Finally, both experimental and theoretical studies of regular structures in falling films are reviewed by Chinnov and Kabov.

On behalf of friends, colleagues, and students, we extend our best wishes to Professor Sergey Alekseenko on the occasion of his 70^{th} birthday.

Vladimir S. Ajaev
Southern Methodist University, USA

Neima Brauner
Tel-Aviv University, Israel

Luis Antonio Davalos-Orozco
UNAM, Mexico

Tatiana Gambaryan-Roisman
Technical University of Darsmstadt, Germany

Oleg A. Kabov
Kutateladze Institute of Thermophysics, Russia

Alexander I. Leontiev
National Committee on Heat and Mass Transfer, Russia

Christos N. Markides
Imperial College London, United Kingdom

Dmitry M. Markovich
Kutateladze Institute of Thermophysics, Russia

Omar K. Matar
Imperial College London, United Kingdom