Preface

Björn Gustafsson · Alexander Vasil'ev

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Great progress in theoretical physics in the twentieth century was stimulated by the deep symbiosis and interplay between mathematics and physics. Besides, new developments in physics have inspired mathematics and led to birth of new mathematical disciplines. Unification of the four forces in nature is a fundamental problem, which makes modern physics coherent and focused. Mathematics is on the other hand united by its methodological standards and rigor. However, there still exists a gap in understanding of physical reasoning and motivation among contemporary analysts and differential geometers. Conversely, practitioners in physics sometimes use analysis and geometry as a tool without deep feeling of the directions of the intrinsic mathematical development.

Efforts within the European and USA research communities have been taken to fill this gap. Such efforts have been continuously supported by the European Science Foundation and by the National Science Foundation (USA) as well as by several national research funding institutions. The creation of scientific networks is particularly important in this process. One example of such a network is the European Science Foundation Programme ‘Harmonic and Complex Analysis and its Applications’ (HCAA), within which scientists from eleven European countries combine their efforts by organizing conferences, workshops, and research exchanges, and by promoting further collaborative work and training of young promising researchers in creative interdisciplinary environments. One of the published results of the network HCAA is a special Birkhäuser volume ‘Analysis and Mathematical Physics’ [1]. The present

B. Gustafsson
Department of Mathematics, KTH, 100 44 Stockholm, Sweden
e-mail: gbjorn@math.kth.se

A. Vasil'ev (✉)
Department of Mathematics, University of Bergen, P.O. Box 7803, 5020 Bergen, Norway
e-mail: alexander.vasiliev@math.uib.no

special issue of 'Complex Analysis and Operator Theory' continues and extends the series of publications, which finally will culminate in the appearance in 2011 of a new Birkhäuser journal, '*Analysis and Mathematical Physics*'.

The present volume contains articles on gravitational lensing, relativistic string theory, field theory for the Dyson gas, minimal surfaces and Clifford systems, sub-Lorentzian geometry and its physical interpretation, analysis on products of Heisenberg groups, Loewner theory, and the Navier–Stokes equations on graphs. We hope that it will be of interest for specialists and graduate students specializing in mathematics and/or mathematical physics. We would like to acknowledge all contributors as well as referees for their great service. We appreciate continuous help of the Birkhäuser Verlag publishing company that makes our ideas a reality. Special thanks go to professor Daniel Alpay, the main editor of the journal *Complex Analysis and Operator Theory*, who supported the idea of this volume.

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Reference

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