

# Preface

Since its invention in the mid-twentieth century the field of microlocal analysis was characterized by a tight interplay of mathematics and physics. While in language and rigor it is a field of mathematics, many of its ideas originate in physics: Its playing field is the cotangent bundle of a manifold, the mathematical counterpart of the phase space of classical mechanics; its motivating problems came from partial differential equations, particularly those arising in physics, like the Laplace equation and the associated spectral problem, and the wave equation. Among its fundamental tools is the WKB method, which was invented for quantum mechanics and also used in geometrical optics; associating an operator to a symbol is one manifestation of quantization. These ideas, often used rather informally in the physics context, were made mathematically precise in microlocal analysis, and often triggered further developments in mathematics, foremost in the field of partial differential equations, but also in symplectic geometry or in singularity theory, to name a few; they were also used in index theory as one of their deepest applications.

In spite of this common ancestry of microlocal analysis in mathematics and physics there are few conferences which bridge the gap between the various communities that use this set of techniques. This is how the idea for the conference ‘Microlocal methods in mathematical physics and global analysis’ arose. Our aim was to bring together researchers at the highest international level in these areas, in order to foster interaction, inform about new developments and get a state of the art picture.

The major themes of the conference were the use or development of microlocal techniques in semiclassical and adiabatic limits, singular spaces, spectral and scattering theory, wave propagation and topological applications, and we have organized this collection of extended abstracts accordingly, although not every talk admits a unique assignment to one of these categories. A recurrent overall theme of many of the talks was the occurrence of singular settings, that is, where the underlying space is singular or non-compact, or where one studies a family of operators or spaces approaching a singular limit. The systematic exploration of such singular problems has been a focus of much research in microlocal analysis since the 1980s.

The present volume is a collection of extended abstracts of most talks at the conference. The talks were given by the first-mentioned authors of each extended abstract. We believe that the format of extended abstract is a valuable means for quick communication of current research, since it allows authors to disseminate their results at an early stage and in a condensed form, and puts an emphasis on conveying the essence of the lectures, without being overburdened by technicalities. Therefore, we hope that this format, which was introduced by the Mathematisches Forschungsinstitut Oberwolfach in 2004 under the name Oberwolfach Reports, will be used more frequently at other conferences as well. We are very grateful to Birkhäuser Verlag for engaging in this new format and agreeing to publish this volume.

The conference could not have happened without the support from various sources: Major funding was supplied by the Deutsche Forschungsgemeinschaft (SFB/Transregio 71, “Geometric PDEs”) and the National Science Foundation of the U.S.A. (grant No. 1067924); we are also grateful to the University of Tübingen for hosting the conference.

The organizers

D. Grieser

S. Teufel

A. Vasy

Microlocal Methods in Mathematical Physics and Global  
Analysis

Grieser, D.; Teufel, S.; Vasy, A. (Eds.)

2013, IX, 148 p. 2 illus. in color., Softcover

ISBN: 978-3-0348-0465-3

A product of Birkhäuser Basel