# Preface

A conference on "Noncommutative Geometry and the Standard Model of Elementary Particle Physics" was held at the Hesselberg Academy (in northern Bavaria, Germany) during the week of March 14–19, 1999. The aim of the conference was to give a systematic exposition of the mathematical foundations and physical applications of noncommutative geometry, along the lines developed by Alain Connes. The conference was actually part of a continuing series of conferences at the Hesselberg Academy held every three years and devoted to important developments in mathematical fields, such as geometric analysis, operator algebras, index theory, and related topics together with their applications to mathematical physics.

The participants of the conference included mathematicians from functional analysis, differential geometry and operator algebras, as well as experts from mathematical physics interested in A. Connes' approach towards the standard model and other physical applications. Thus a large range of topics, from mathematical foundations to recent physical applications, could be covered in a substantial way. The proceedings of this conference, organized in a coherent and systematic way, are presented here. Its three chapters correspond to the main areas discussed during the conference:

**Chapter 1.** Foundations of Noncommutative Geometry and Basic Model Building

**Chapter 2.** The Lagrangian of the Standard Model Derived from Noncommutative Geometry

**Chapter 3.** New Directions in Noncommutative Geometry and Mathematical Physics

During the conference the close interaction between mathematicians and mathematical physicists turned out to be quite fruitful and enlightening for both sides. Similarly, it is hoped that the proceedings presented here will be useful for mathematicians interested in basic physical questions and for physicists aiming at a more conceptual understanding of classical and quantum field theory from a novel mathematical point of view. Of course, the whole field is under active development and important aspects, such as field theory of extended objects or advances in renormalization theory, could only be touched upon here; these may be covered in subsequent meetings of the Hesselberg conference series.

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