

MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH

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Noncommutative Geometry

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ABSTRACT. Many of the different aspects of Noncommutative Geometry were represented in the talks. The list of topics that were covered includes in particular new insight into the geometry of a noncommutative torus, local index formulae in various situations, C^* -algebras and dynamical systems associated with number theoretic structures, new methods in K -theory for noncommutative algebras as well as new progress in quantum field theory using concepts from noncommutative geometry.

Mathematics Subject Classification (2000): 46Lxx, 19xx, 81Txx.

Introduction by the Organisers

Noncommutative geometry applies ideas from geometry to mathematical structures determined by noncommuting variables. Within mathematics, it is a highly interdisciplinary subject drawing ideas and methods from many areas of mathematics and physics. Natural questions involving noncommuting variables arise in abundance in many parts of mathematics and theoretical quantum physics. On the basis of ideas and methods from algebraic and differential topology and Riemannian geometry, as well as from the theory of operator algebras and from homological algebra, an extensive machinery has been developed which permits the formulation and investigation of the geometric properties of noncommutative structures. This includes K -theory, cyclic homology and the theory of spectral triples. Areas of intense research in recent years are related to topics such as index theory, quantum groups and Hopf algebras, the Novikov and Baum-Connes conjectures as well as to the study of specific questions in other fields such as number theory, modular forms, topological dynamical systems, renormalization

theory, theoretical high-energy physics and string theory. Many results elucidate important properties of fascinating specific classes of examples that arise in many applications.

The talks at this meeting covered substantial new results and insights in several of the different areas in Noncommutative Geometry. The workshop was attended by 51 participants.