Mathematisches Forschungsinstitut Oberwolfach

Report No. 45/2011

DOI: 10.4171/OWR/2011/45

Noncommutative Geometry

Organised by
Alain Connes, Paris
Joachim Cuntz, Münster
Marc A. Rieffel, Berkeley
Guoliang Yu, Nashville

September 11th – September 17th, 2011

Abstract. Noncommutative Geometry applies ideas from geometry to mathematical structures determined by noncommuting variables. This meeting concentrated primarily on those aspects of Noncommutative Geometry that are related to index theory and on the connections between operator algebras and number theory.

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 include topics such as index theory, quantum groups and Hopf algebras, the Novikov and Baum-Connes conjectures as well as the study of specific noncommutative structures arising from other fields such as number theory, modular forms or topological dynamical systems. 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 emphasis this time was on noncommutative structures and methods related to index theory on the one hand and to number theory on the other. The workshop was attended by 55 participants.

Workshop: Noncommutative Geometry

Table of Contents