

Prof. Dr. W. Müller  
Dr. J. Pfaff

Wintersemester 2013/14  
**Seminar on Global Analysis S4B3:**  
**Dirac operators and Riemannian geometry**

The seminar is concerned with Dirac operators on Riemannian manifolds. The basic example is the classical Dirac operator in  $\mathbb{R}^4$ . Dirac operators are a class of geometrically defined differential operators on Riemannian manifolds, which play an important role in various fields of mathematics like topology, global analysis, differential geometry and mathematical physics. For example, Dirac operators play a central role in the Atiyah-Singer index theorem and Seiberg-Witten theory, which in turn has important applications in the topology of 3- and 4-dimensional manifolds. The goal of the seminar is to establish basic facts about Dirac operators and discuss some important applications and results.

**Prerequisites:** Geometrie I.

**Date:** Tuesday, 16:15 – 17:45, room 0.008

**Distribution of talks:** Wednesday, October 2, 14:15, room 0.008, or by e-mail

**Literature:**

1. Th. Friedrich: Dirac-Operatoren in der Riemannschen Geometrie, Vieweg, 1997
2. M.B. Lawson u. M.-L. Michelson: Spin Geometry, Princeton Univ. Press, 1989.
3. B. Thaller: The Dirac equation, Springer-Verlag, 1992

**Kontakt:** pfaff@math.uni-bonn.de, mueller@math.uni-bonn.de

## Talks

1. Clifford algebras and the group  $Spin(n)$
2. Classification of representations of Clifford algebras
3. Spin representations
4. Principal fibre bundles
5. Spin structures
6. Dirac operators
7. Analytic properties of Dirac operators
8. Spectral properties of Dirac operators
9. The Lichnerowicz-Weizenböck formula and its applications
10. Harmonic spinors (after Hitchin)
11. Gromov-Lawson-Rosenberg conjecture I
12. Gromov-Lawson-Rosenberg conjecture II