Workshop on
Dirac operators, quantum groups, and Lie algebroids
March 18-19, Department of Mathematics AU

Wednesday March 18, Koll. G4

- (11:15 - 12:00) Antoni Pierzchalski (Lodz): Gradients and the Dirac operator on Lie algebroids, I

  Abstract: Stein-Weiss gradients on Lie algebroids will be defined and discussed. Their shape for some tensor bundles wil be given. The geometry of associated operators: Cauchy-Ahlfors, twistor, Ahlfors-Laplace, etc will be described. Twistor forms, their conformal invariance and a relation to Hamiltonian two forms will be mentioned.

- (13:15 - 14:00) Bogdan Balcerzak (Lodz): Gradients and the Dirac operator on Lie algebroids, II

  Abstract: Two families of Dirac operators on Lie algebroids will be defined and investigated. The first one includes the Dirac operators, each of which is defined by the given Clifford algebra and the connection. The Clifford algebra structure comes from the metric structure in the fibers of the Lie algebroid and not necessarily in the fibres of the tangent bundle as it is in the classical case. The metric structure is given here by a symmetric tensor field on the Lie algebroid that need not to be nondegenerate. Dirac operators, as considered here, are the first order differential operators such that the symbol of their squares are of metric types. The second family of Dirac operators come from the skew-symmetric bilinear forms, which give the structures of the Weyl algebras - which are skew-symmetric counterparts of Clifford algebras. The connections considered here are the algebroid type. Moreover, we do not assume that they are torsion-free or compatible with the given Clifford or Weyl structures. Consequently, we are able to consider some general types of Dirac operators. In both cases, Weitzenböck type formulas for the square of the Dirac operators will be derived. Some particular (eg. pseudo-Riemannian or symplectic) cases will be discussed.

- (14:15 - 15:00) Ulrich Krähmer (Glasgow): Dirac operators on quantum group versions of symmetric spaces
- (15:15 - 16:00) Ryszard Nest (Copenhagen): Index theorems and Lie algebroids
- (16:15 - 17:00) Anna Kimaczynska (Lodz): The gradient and the divergence at the boundary

  Abstract: The operators of gradients and divergence in the symmetric tensor bundle will be descibed. The Green type formula wil be derived. Some of the natural boundary conditions will be discussed.

DINNER

Thursday March 19, Koll. G4

Questions, comments, and discussions following the Wednesday lectures:

- (10:15 - 12:00) Pierzchalski - Balcerzak

  including remarks by Pierzchalski on "The Laplace type operators in the symmetric bundle"or "Some remarks on gradients at the boundary"
- (14:15 - 15:00) Ulrich Krähmer: Cohomology of Lie algebroids

  Abstract: Universal enveloping algebras of Lie algebras are classical examples of quantum groups (Hopf algebras). In this talk I will discuss to what extent the universal enveloping algebras of Lie algebroids are quantum groupoids (Hopf algebroids), what this question has to do with homological algebra and maybe even with the foundations of mathematics.
- (15:30 - 17:00) Kimaczynska - Krähmer

Bent Ørsted