

# TEMPLE UNIVERSITY

Department of Mathematics

## Analysis Seminar

Room 617 Wachman Hall

Monday, September 22, 2014, 2:40 p.m.

### *The Witten deformation on singular spaces*

by Ursula Ludwig,

Department of Mathematics  
Paris-Orsay

About 30 years ago motivated by ideas in quantum field theory, Witten introduced a beautiful new approach to proving the famous Morse inequalities based on the deformation of the de Rham complex (see “Supersymmetry and Morse Theory”, J. of Diff. Geometry, 17). His ideas were fruitfully extended in different situations since, e.g. to the holomorphic setting, for manifolds with boundaries...

The aim of this talk is to present a generalisation of the Witten deformation to a singular space  $X$  with cone-like singularities and radial Morse functions. As a result one gets Morse inequalities for the  $L^2$ -cohomology, or dually for the intersection homology of the singular space  $X$ . Moreover, as in the smooth theory, one can relate the Witten complex, i.e. the complex generated by the eigenforms to small eigenvalues of the Witten Laplacian, to an appropriate geometric complex (a singular analogue of the smooth Morse-Thom-Smale complex).

Radial Morse functions are inspired from the notion of a radial vector field on a singular space. Radial vector fields have first been used by Marie-Hélène Schwartz to define characteristic classes on singular varieties.

In the introductory part of the talk, we will recall the Witten deformation in the classical situation. If time allows, deformations on singular spaces with other than radial Morse functions will be discussed as well.