Meeting: 1001, Evanston, Illinois, SS 3A, Special Session on Index Theory, Morse Theory, and the Witten Deformation Method

1001-57-111 **Dan Burghelea** and **Stefan Haller*** (stefan.haller@univie.ac.at), Department of Mathematics, University of Vienna, Nordbergstrasse 15, A-1090 Vienna, Austria. *The geometric complex of a Morse–Bott–Smale pair and an extension of a theorem by Bismut–Zhang.*

Let M be a closed Riemannian manifold and E a flat vector bundle over M equipped with a fiber metric. In this situation one has a Ray–Singer torsion T_{an}^M — a super determinant of the deRham differential. Suppose X is a Morse–Bott–Smale vector field on M with critical manifold Σ. Every connected component $S \subseteq \Sigma$ has a Ray–Singer torsion T_{an}^S on its own. The Morse–Bott complex is a filtered graded complex computing $H^*(M;E)$. Using the differentials in the associated (finite dimensional) spectral sequence one defines a combinatoric torsion T_{comb}. Our main result is the following localization formula for the analytic torsion:

$$\log T_{\text{an}}^M = \sum_{S\subseteq\Sigma} (-)^{\text{ind}(S)} \log T_{\text{an}}^S + \log T_{\text{comb}} + \log T_{\text{met}} + \int_M \theta \wedge (-X)^*\Psi$$

Here T_{met} is the volume of the integration isomorphism from deRham cohomology to Morse–Bott cohomology. In the last term Ψ is the Mathai–Quillen form and θ is a closed one form which measures to what extend the fiber metric on E is not parallel. If X is Morse–Smale then Σ is discrete and the formula reduces to a theorem of Bismut–Zhang. The proof we give is based on the Bismut–Zhang theorem. (Received August 18, 2004)