What is higher Reidemeister torsion?

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Thursday, February 12, 2009
007 Kemeny Hall, 4:00 pm
(Tea 3:30 pm 300 Kemeny Hall)

Abstract

Higher Reidemeister torsion is a sequence of cohomology classes designed to detect exotic smooth structures on smooth manifold bundles. There are three independent constructions of this invariant using Morse theory (Igusa-Klein torsion,), homotopy theory (Dwyer-Weiss-Williams torsion) and analysis (Bismut-Lott analytic torsion). Calculations show that they are not equal and it is one of the main problems to show exactly how these constructions are related. Recent work of Goette, Dorabiala, Klein shows that this project is close to completion.

Each construction is rather technical, but I will explain some of the basic properties of the three invariants. The special cases of surface bundles and graph bundles are particularly interesting. Here the invariants disagree. The analytic torsion is zero but the Morse theory version is proportional to the even tautological classes which are related to graph cohomology and Witten-Kontsevich cycles [1] and I will concentrate on that aspect.

[1] K. Igusa, Graph cohomology and Kontsevich cycles, Topology 43 (2004), no. 6, 1469–61510.

This talk should be accessible to graduate students.

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