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Torsion homology growth and L^2-torsion

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The L^2-torsion of a hyperbolic (2n+1)-manifold is proportional to its hyperbolic volume. The invariant can (in principle) be defined for any cocompact free L^2-acyclic G-CW complex X and may be thought of as a notion of hyperbolic volume for X/G. When G is residually finite a conjecture of L\"uck relates the growth rate of the size of torsion in the homology of finite covers of X/G with the L^2-torsion of X. I will discuss this conjecture and recent results related to it in the context of automorphisms of groups, the handlebody groups, and more. Based on recent joint work with Wolfgang L\"uck and older joint works with Naomi Andrew, Yassine Guerch, Sebastian Hensel, Monika Kudlinska and Ric Wade.

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