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Reidemeister torsion for hyperbolic 3-manifolds

Reidemeister torsion is an invariant defined for a CW-complex and a linear representation of its fundamental group. It was first defined in the 1930s by Reidemeister, de Rham and Franz to classify lens spaces in dimension 3, and since then it has proven to be a powerful invariant. In this talk, I will first give a brief review of Reidemeister torsion, and how to define it for a hyperbolic 3-manifold. Then I will introduce a certain class of invariants $\{ T_n(M) \}$ attached to a hyperbolic manifold M , which are defined as the Reidemeister torsion of M with respect to the composition of the holonomy representation of M and the n -dimensional fundamental representation of $SL(n, \mathbb{C})$. I will show that the sequence $\{ \log |T_n(M)| / n^2 \}$ converges to $-\text{Vol}(M)/4\pi$ (this is an extension of a result by W. Müller which deals with closed manifolds). Finally, I will discuss how the sequence $\{ T_n(M) \}$ determines and is determined by the complex length spectrum of M . This is joint work with Joan Porti.