Sophus Lie Days

October 10–11, 2013

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Lecture I – "Universal Sounds" of Anti-de Sitter Manifolds

In musical instruments, shorter strings produce a higher pitch than longer strings, and thinner strings produce a higher pitch than thicker strings. Similarly, in compact Riemann surfaces, any nonzero eigenvalue of the Laplacian varies as a function on Teichmüller space. In Riemannian geometry, the eigenvalues of the Laplacian of a compact manifold provide rich information about the original manifold, and some aspects of spectral geometry are well known from the article "Can one hear the shape of a drum?" (M. Kac, 1966).

What properties can be found beyond Riemannian geometry? I plan to talk about a strange phenomenon in anti-de Sitter manifolds: there exist countably many stable eigenvalues of the Laplacian that do not vary under the deformation of geometric structure. The proof uses the geometry of discrete groups, partial differential equations, integral geometry (e.g., the idea of a CT scan), and various ideas coming from Lie groups.

The talk will be aimed at a general mathematical audience, and a main part will be accessible to undergraduates with basic knowledge of advanced calculus, linear algebra, and (a little) topology. The non-expository part of the talk is based on joint work with F. Kassel.

Lecture II will follow on Friday, October 11 at 2:00 PM in 406 Malott Hall.

Thursday, October 10, 2013 at 4:00 PM in 532 Malott Hall

Refreshments will be served at 3:30 PM in the Mathematics Department lounge (532 Malott Hall).