FIELDS

THE FIELDS INSTITUTE

March 16 - 18, 2015
at The Fields Institute

WORKSHOP ON The Geometry *of* Noncommutative Manifolds

Organizing Committee

George Elliott
Piotr M. Hajac
Jonathan Rosenberg

While there is no universal agreement on a definition of a noncommutative manifold, there is general agreement on the most basic examples. Aside from such manifolds which are "almost commutative," such as Azumaya algebras over the algebra of functions on an ordinary (commutative) manifold, there are the noncommutative tori, which have attracted a huge amount of attention. In dimension 2, these specialize to the famous "irrational rotation algebras." Other examples of noncommutative manifolds are noncommutative Riemann surfaces, the quantum group $SU_q(2)$ (which can be viewed as a noncommutative S^3), and the Podleś spheres.

Geometry on the noncommutative 2-torus or irrational rotation algebra has now advanced to the point where there is work on analogues of many classical theorems in the classical differential geometry of surfaces. The approach that has been tried most is studying the zeta function of the "Laplacian" for a conformal deformation of a flat metric Laplacian by a conformal factor in the (noncommutative) algebra. By this method Connes and Tretkoff have proved a kind of Gauss-Bonnet theorem, and more recently, Connes and Moscovici and Fathizadeh and Khalkhali have studied the analogue of the scalar curvature function. An alternative approach of Rosenberg starts with a more general notion of Riemannian metric and gives a unique associated "Levi-Civita connection" from which various geometric invariants can be extracted. One of the purposes of this workshop will be to try to reconcile these two very different approaches. Another focus of the workshop will be attempts to carry over what has been done for noncommutative 2-tori to other noncommutative manifolds, such as higher-dimensional noncommutative tori (for which there are some partial results) and noncommutative spheres and Riemann surfaces of genus > 1.

This Workshop will include two minicourses intended for graduate students, each approximately three hours long, together with more specialized lectures for experts, and some time for informal discussions.

For more information, please visit:
www.fields.utoronto.ca/programs/scientific/14-15/manifolds

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THE FIELDS INSTITUTE FOR RESEARCH IN MATHEMATICAL SCIENCES
222 College Street, Second Floor, Toronto, Ontario, M5T 3J1 • www.fields.utoronto.ca • 416-348-9710