

General Mathematics Seminar
of the
University of Luxembourg
in cooperation with the
Luxembourg Mathematical Society

November, 2014

Tuesday, November 4, 2014 at 17.00

Campus Kirchberg, Room B02

Prof. Thomas Willwacher
(ETH, Zurich)

Jointly orthogonal polynomials and classical ODEs

Abstract: The classical families of orthogonal polynomials (Jacobi, Laguerre, Hermite) are equivalently uniquely characterized as being solutions to some second order differential equations, or through their orthogonality properties. There are many other classical second order differential equations giving rise to families of polynomials, which also satisfy orthogonality properties, but with respect to multiple inner products. For example, the polynomial solutions of the Lamé equation are simultaneously orthogonal with respect to two inner products. It has been an open problem whether the orthogonality properties in these cases already uniquely determine the polynomials (up to scalars). We answer this question positively, by developing a theory of polynomials orthogonal with respect to multiple inner products in a suitable sense.

(A note to experts: our notion of “jointly orthogonal” polynomials is quite different from the existing notion of “multiple orthogonal” polynomials, which has seen rising interest in recent years, but seems not applicable to the above problem.)

The talk will be relatively elementary and accessible. We will also discuss some less known elements of linear algebra, in particular how to define the eigenvalues and -vectors of a non-square matrix.

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Tuesday, November 18, 2014 at 17.00

Campus Kirchberg, Room B02

Prof. Ping Xu
(Pennsylvania State University)

Symplectic realizations and $+1$ shifted symplectic stacks

Abstract: For a smooth manifold X , it is well known that T^*X is a symplectic manifold. The manifold X can be seen as a (rather trivial) Poisson manifold when endowed with the zero Poisson bracket. The canonical projection from T^*X to X is a Poisson map and X is embedded as a Lagrangian submanifold of T^*X (by the zero section). In this talk, I will discuss a few important extensions of this result to non-trivial (smooth or holomorphic) Poisson manifolds and its connection with PTVV $+1$ shifted symplectic stacks.

General Mathematics Seminar
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November, 2014

Tuesday, November 25, 2014 at 17.00

Campus Kirchberg, Room B02

Prof. Stanislaw Janeczko
(Warsaw University of Technology, Polish Academy of Sciences)

On exotic shapes of nano-spherical structures

Abstract: The simplest naturally ordered tetrahedral packing is built of an ordered sequence of regular tetrahedra glued together face to face like linear packing of tetrahedral helix, introduced implicitly by H. S. M. Coxeter. We show an explicit formula for positions of all vertices and the complete description of the geometric structure with optimal and singular folding of tetrahedral chains. Parametrization of chains by sequences of ordered reflections is constructed and periodicity in their combinatorial structure is found. Periodicity along a chain is based on the structure of sequences of admissible triplets of integers and their cycling properties. The corresponding numerical invariants and an indexing role of a binary tetrahedral group were established. Applications with the practical use in nano-medicine will be presented.