

Mathematical Physics Seminars

2013-2014

All seminars are held in Room M/2.06 on Thursdays at 3:10pm unless otherwise stated. All are welcome.

Programme Organiser and Contact: [Professor David E Evans](#)

Tuesday 24 September 2013 at 15:10

WIMCS Mathematical Physics Colloquium

Speaker: Akitaka Kishimoto

Title: Maximality of the analytic subalgebras of C^* -algebras with flows.

Thursday 10 October 2013

Speaker: Prem Kumar (Swansea)

Title: The holographic equivalence between gauge theory and gravity.

Thursday 17 October 2013

COW Seminar

Organized by Timothy Logvinenko

Speakers:

14:00 Michael Groechenig (London). **Title:** Higgs bundles and crepant resolutions.

15:30 Sebastian Franco (Durham). **Title:** Bipartite field theories: from QFT to algebraic geometry, combinatorics and cluster algebras.

17:00 Will Donovan (Edinburgh). **Title:** Noncommutative deformations and 3-fold flops.

All talks are in Glamorgan Council Chamber, Glamorgan Building.

Friday 18 October 2013 at Glamorgan Council Chamber, Glamorgan Building.

Categorically Cardiff: Derived Categories and Algebraic Geometry

Organized by Timothy Logvinenko

Speakers:

Morning (10:00-12:00)

Ivan Cheltsov (Edinburgh). **Title:** Asymptotically log Fano varieties.

Alastair Craw (Bath). **Title:** TBA

Afternoon (14:00-18:00)

Miles Reid (Warwick). **Title:** Clusters, quivers, boats and traps

Richard Thomas (Imperial). **Title:** Counting curves in 3-folds and K3 surfaces.

Timothy Logvinenko (Cardiff). **Title:** On braiding criteria for spherical twists.

Thursday 24 October 2013

Speaker: Alastair King (Bath)

Title: Dimers on a disk and Grassmannian cluster categories.

Thursday 7th November 2013

Speaker: Tim Hollowood (Swansea)

Title: The Emergent Copenhagen Interpretation of Quantum Mechanics.

Thursday 14th November 2013

Speaker: Nick Wright (Southampton)

Title: K-theory of group C*-algebras and translation algebras.

Abstract: Pimsner and Voiculescu's celebrated sequence allows the computation of the K-theory for crossed products of a C*-algebra with the group of integers and more generally for crossed products with any free group. In this talk I will develop the concepts of group C*-algebras and more generally translation algebras and explain how the Pimsner-Voiculescu sequence can be seen as an example of a more general construction. As an application I will show how this can be used to compute the K-theory for group C*-algebras.

Thursday 5th December 2013

Speaker: Xin Li (Queen Mary, London)

Title: C*-algebras, monoids, and dynamical systems.

Abstract: This talk is about semigroup C*-algebras on the one hand, and the interplay between C*-algebras and dynamical systems on the other hand. I give an overview of recent developments.

Thursday 12th December 2013

Speaker: Felix Rehren (Birmingham)

Title: Nonassociative algebras from VOAs and fusion rules.

Abstract: Vertex Operator Algebras (VOAs) of moonshine-type contain a nonassociative commutative algebra at weight-2. The classical example is the Griess algebra lying in the Monster VOA, whose automorphism group the Monster is the largest of the sporadic simple groups. Miyamoto proved that idempotents in the weight-2 algebra of moonshine-type VOAs carry representations of the Virasoro algebra; Sakuma's theorem restricts the possible VOAs generated by certain such representations. In work joint with J. I. Hall and S. Shpectorov, we show that the algebraic theory of Sakuma follows from a simple axiomatisation of algebras generated by idempotents controlled by fusion rules, and it has deep connections to finite group theory.

17-19 December 2013

Workshop on Combinatorial Physics

Organized by Roger Behrend

Thursday 30th January 2014

Speaker: Ed Corrigan FRS (York).

Title: Aspects of defects in integrable models.

Abstract: Though defects in a general sense are ubiquitous and much-studied within statistical mechanics models it is only recently that they have been considered within integrable field theory. At first sight, defects could be considered disastrous since the property of integrability might be lost. However, it turns out that not only is it possible to have 'integrable defects' but they have a range of interesting properties and cast some new light on traditional features. Several examples will be described, together with their properties in classical and quantum versions of the models.

Thursday 6th February 2014

Speaker: Charlie Beil (Bristol).

Title: Nonlocality and the central geometry of dimer algebras.

Abstract: Dimer algebras with the cancellation property are Calabi-Yau algebras whose centers are 3-dimensional Gorenstein singularities. Non-cancellative dimer algebras, on the other hand, are not Calabi-Yau, and their centers are nonnoetherian. In contrast to their cancellative counterparts, very little is known about these algebras, despite the fact that almost all dimer algebras are non-cancellative. I will describe how their centers are also 3-dimensional Gorenstein singularities, but with the strange property that they contain positive dimensional points. I will also describe how Higgsing gives rise to local Morita equivalences between non-cancellative and cancellative dimer algebras.

Thursday 13th February 2014

Speaker: Joachim Zacharias (Glasgow).

Title: Spectral Triples and Noncommutative Metric Spaces.

Abstract: Spectral triples are a fundamental concept in noncommutative Geometry with wide ranging applications in Mathematics and Physics including Quantum Gravity. They can be regarded as non commutative analogues of elliptic operators. We will give a brief introduction to the concept of spectral triples and their regularity properties. An important problem is the existence and construction of spectral triples on concrete C^* -algebras or classes of C^* -algebras. We will present numerous standard examples of spectral triples and discuss some new constructions of spectral triples with various regularity properties starting from given ones, e.g. on extensions and crossed products.

Thursday 6th March 2014

Speaker: Yang-Hui He (City University London).

Title: Quivers, Dessins and Calabi-Yau.

Abstract: We discuss how bipartite graphs on Riemann surfaces encapture a wealth of information about the physics and the mathematics of gauge theories. The correspondence between the gauge theory, the underlying algebraic geometry of its space of vacua, the combinatorics of dimers and toric varieties, as well as the number theory of dessin d'enfants becomes particular intricate under this light.

Tuesday 27th May 2014 - Thursday 26th June 2014 at 10.00am

Speaker: Terry Gannon (Alberta).

Title: Vertex Operator Algebras

Talks will be on the following dates:

- ✦ **Tuesday 27 May** and **Thursday 29 May**
- ✦ **Monday 2 June** and **Thursday 5 June**
- ✦ **Monday 9 June** and **Wednesday 11 June**
- ✦ **Monday 16 June** and **Thursday 19 June**
- ✦ **Tuesday 24 June** and **Thursday 26 June**

Thursday 29th May 2014

Speaker: Robert Marsh (Leeds).

Title: Twists of Pluecker coordinates as dimer partition functions.

Abstract: The homogeneous coordinate ring of the Grassmannian $Gr(k,n)$ has a cluster algebra structure defined in terms of planar diagrams known as Postnikov diagrams. The cluster corresponding to such a diagram consists entirely of Pluecker coordinates. We introduce a twist map on $Gr(k,n)$, related to the Berenstein-Fomin-Zelevinsky twist, with a linear algebraic definition.

We give an explicit Laurent expansion for the twist of an arbitrary Pluecker coordinate in terms of the cluster variables associated with a fixed Postnikov diagram. The expansion arises as a scaled dimer partition function (i.e. matching polynomial) of a weighted version of the bipartite graph dual to the Postnikov diagram, modified by a boundary condition determined by the Pluecker coordinate.

Thursday 5th June 2014

Speaker: Christian Voigt (Glasgow).

Title: Clifford algebras, Fermions, and categorification

Abstract: I will describe a categorification of complex Clifford algebras arising from certain categories of twisted modules over fermionic vertex superalgebras. The product in these categorified Clifford algebras is closely related to fusion of surface defects in 3D topological field theory. The higher categorical structure arises from varying polarisations in the construction of fermionic Fock spaces. I will include some background from the theory of unitary vertex algebras, and discuss how the String 2-group fits naturally into the picture.

Thursday 19th June 2014

Speaker: Amihay Hanany (Imperial).

Thursday 26th June 2014

Speaker: Katarzyna Rejzner (York).