

Geometry, Algebra, Mathematical Physics and Topology Research Group

All seminars are held in Room M2.06 on Thursdays at 15:10 unless otherwise stated.
All are welcome.

Programme organiser and contact: [Dr Mathew Pugh](#)

Date	Speaker	Seminar
5 October 2017	Gerard Watts (King's)	Conformal Field Theory defects - old and new
Room M1.02		I will try to summarise some old and some new work on defects in two dimensional conformal field theory. Defects have played important roles from the Jordan- Wigner transformation onwards, but there are still interesting questions to ask and some hope that they can be answered.
16 October 2017	Rolf Gohm (Aberystwyth)	Star generators of S_∞ as a noncommutative exchangeable sequence
16:10-17:00		Gohm and Koestler developed an interpretation of Thoma's formula for extremal characters of S_∞ as a de Finetti type theorem. Here a basic observation is that the so-called star generators form a noncommutative exchangeable sequence. We discuss the method and explore its

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		<p>potential by looking at more general states for which this basic observation still holds.</p>
26 October 2017	Paweł Dłotko (Swansea)	<p>Practical problems, theory and computations: A few simple stories on topology in action</p> <p>In this talk I will present a few problems in applied science that have been solved using methods from computational topology and in general computational mathematics. Starting from down-to-earth material science, via dynamical systems, ending up in brain research. I will present a feedback loop between theory and algorithms: how those two works together to solve problems, how they get mutual inspiration and why in applied sciences they should not be separated.</p>
2 November 2017	Simon Wassermann (Glasgow)	<p>Free groups and operator algebras</p> <p>Operator algebras arising from free groups have provided important examples in the subject, starting with von Neumann's celebrated construction of non-isomorphic factors in the 1930s. Another milestone was the proof by Pimsner and Voiculescu in the 1980s that the regular C^*-algebras of free groups on n generators are nonisomorphic, for different n. In this talk I shall present an extension of the the latter result to products</p>

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		of free groups and more general free product algebras and discuss some open problems.
8 November 2017		<p>Maths Colloquium</p> <p>Speaker: Constantin Teleman (Oxford)</p>
9 November 2017	Alexander Kasprzyk (Nottingham)	<p>Classifying Fano manifolds via Mirror Symmetry</p> <p>In this talk I will explain recent work attempting to classify Fano manifolds using techniques from Mirror Symmetry. In particular, I will focus on the two- and three-dimensional setting, where the techniques are most developed. I hope to indicate some open problems and conjectures, and to illustrate the close connections with toric geometry and combinatorics.</p>
23 November 2017	Ilke Canakci (Newcastle)	<p>Cluster algebras, snake graphs and continued fractions</p> <p>Snake graphs are planar graphs first appeared in the context of cluster algebras associated to marked surfaces. In their first incarnation, snake graphs were used to give formulas for generators of cluster algebras. Along with further investigations and several applications, snake graphs were also studied from a more abstract point of view as combinatorial objects. In this talk, I will report on joint work with Ralf Schiffler where we introduce a link to continued</p>

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		<p>fractions. More precisely, we give a combinatorial realisation of continued fractions in terms of 'perfect matchings' of snake graphs. I will also discuss applications to cluster algebras as well as to elementary number theory.</p>
30 November 2017	David Ridout (Melbourne)	<p>Weight modules for \mathfrak{sl}_3 and conformal field theory</p> <p>One of the most fundamental families of conformal field theories, the Wess-Zumino-Witten models, relies heavily on the theory of irreducible highest-weight representations of affine Kac-Moody algebras. However, there are many other interesting models with affine symmetry for which one needs representations that have neither of these properties. This motivates studying more general classes of weight modules, starting with those for simple Lie algebras. I will review what's known, concentrating on \mathfrak{sl}_2 and \mathfrak{sl}_3, and explain the relevance to conformal field theory.</p>
7 December 2017	Kazuya Kawasetsu (Melbourne)	<p>The characters of relaxed highest-weight modules over affine Kac-Moody algebras</p> <p>The relaxed highest-weight modules over affine Kac-Moody algebras play an important role in the Creutzig-Ridout Verlinde formula for admissible affine vertex algebras. In this talk, we compute the characters of the irreducible relaxed highest-</p>

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		<p>weight modules over the affine Kac-Moody algebra $\widehat{\mathfrak{sl}}_2$ induced from the dense irreducible modules over \mathfrak{sl}_2, using Mathieu's coherent families. We show that the characters are "coherent", that is, they are the product of a q-series and a formal delta function in z. If time allows, we will also consider the characters of relaxed highest-weight modules over $\widehat{\mathfrak{osp}}(1 2)$ and $\widehat{\mathfrak{sl}}_3$.</p> <p>This is a joint work with David Ridout.</p>
<p>13-15 December 2017</p>		<p>LMS South Wales & South West Regional Meeting and Workshop on Algebraic Structures and Quantum Physics</p> <p>Speakers include: Shahn Majid (Queen Mary), Ingo Runkel (Hamburg), Chris Fewster (York), Veronique Fisher (Bath), Christian Korff (Glasgow), Pieter Naaijken (Aachen), Ulrich Pennig (Cardiff), Ko Sanders (Dublin), Anne Taormina (Durham), Michael Tuite (Galway)</p>
<p>1 February 2018</p>	<p>Oscar Bandtlow (QMUL)</p>	<p>Asymptotics of Kolmogorov's epsilon-entropy</p> <p>In this talk, which should be accessible to a general audience, I will discuss the notion of epsilon-entropy of compact sets, originally due to Kolmogorov. I will then discuss a new proof for the asymptotics of the epsilon-entropy of compact sets of holomorphic</p>

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		<p>functions which relies on ideas from operator theory and potential theory.</p> <p>This is joint work with Stephanie Nivoche (Nice).</p>
13 February 2018		<p>Calf in Cardiff</p> <p>13:00-17:00, Queen's Buildings, South Building room S/3.21</p> <p>Speakers: Oliver E. Anderson (Liverpool), Mirko Mauri (LSGNT), Vladimir Eremichev (Warwick)</p>
15 February 2018	Nelly Villamizar (Swansea)	<p>Geometric realizations of spline spaces on a simplicial complex</p> <p>We consider the space of C^r-continuous splines (or piecewise polynomial functions) defined on a simplicial complex. Besides the practical applications of splines, including the solution of partial differential equations by the finite element method, and the approximation of shapes in geometric modeling, the space of C^r-continuous splines forms a ring, and one can study its algebraic structure. More precisely, the space of C^0-continuous splines is a quotient of the Stanley-Reisner ring of the corresponding simplicial complex, and the geometric realization of the Stanley-Reisner ring reflects the structure of the simplicial complex. In the talk, we shall consider the generalized Stanley-Reisner rings associated</p>

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		<p>to a simplicial complex, namely the ring of spline functions with higher order of global continuity on the simplicial complex, and give a description of their geometric realizations for particular instances of the dual graph of the complex. We will also discuss related open problems in this area.</p>
22 March 2018	Gandalf Lechner (Cardiff)	<p>Examples and deformations of algebraic quantum field theories</p> <p>In this talk, I will first explain how so-called Borchers triples - consisting of an algebra of operators acting on a Hilbert space, a representation of the Poincaré group on that space, and an invariant vector satisfying certain compatibility assumptions - gives rise to examples of quantum field theories. I will then discuss a procedure ("warped convolution") related to Rieffel's deformation that can be used to deform such triples in a certain sense and define non-trivial quantum field theories. Following suggestions from within the GAPT group, my plan is to avoid the technical details of the construction and rather include a post seminar discussion in the Pen & Wig.</p>
12 April 2018	Daniela Cadamuro (TU Munich)	<p>An introduction to quantum integrable models in the algebraic framework</p>
15.10-15.55		<p>Quantum integrable models are a special class of quantum field theories in 1+1 dimensional Minkowski space. A consistent</p>

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		<p>mathematical framework for the construction of these models can be formulated in the language of C^*- or von Neumann algebras. In particular, it makes use of the concept of “wedge algebras”, an intermediate step to the construction that helps controlling the functional analytic properties of physically relevant operators.</p>
12 April 2018	Henning Bostelmann (York)	The status of pointlike fields in integrable quantum field theories
16.10-16.55		<p>Integrable QFTs are heuristically thought to be generated by interacting pointlike quantum fields. However, these objects are mathematically very difficult to control. In this talk, we explicitly construct pointlike fields in a specific situation (the massive Ising model), show that they correspond to closable operators affiliated with the local net of von Neumann algebras, and verify that they generate all local quantities in a certain sense.</p>
19 April 2018	Simon Blackburn (Royal Holloway)	<p>Cryptography using group theory</p> <p>Over the past 20 years, there have been frequent proposals to use group-theoretic techniques in the design of cryptosystems. I will provide a brief introduction to the area, and I will talk about some of the techniques that can be used to attack some of these</p>

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26 April 2018	Claudia Scheimbauer (Oxford)	<p>schemes. I will assume no knowledge of cryptography, and very little group theory.</p> <p>From topological field theories to “higher” algebra</p> <p>We will start this talk with an introduction to the Atiyah-Segal approach to topological field theories. This approach has encouraged many developments of so-called "higher" algebra and "higher" categories in the last three decades. We will see how a classification of so called "fully extended" topological field theories leads to studying algebraic "dualizability" conditions, generalizing a finite dimensional vector space and its dual. The study of these conditions has led to many interesting connections to different fields of mathematics, e.g. in representation theory.</p>
3 May 2018	Michael Joachim (Münster)	<p>On applications of twisted spin cobordism theory</p> <p>Hebestreit and Joachim generalized the Anderson-Brown-Peterson splitting for spin cobordism to the twisted set-up. In our talk we will show how classical applications, which use the Anderson-Brown-Peterson splitting, can be generalized to give results for twisted spin cobordism and twisted K-theory.</p>

Date	Speaker	Seminar
10 May 2018	Olalla Castro-Alvaredo (City)	Entanglement Measures in 1+1 Dimensional Quantum Field Theory

In this talk I will present a brief introduction to a research area I have been contributing to for the past 11 years. My research addresses the question of how to compute measures of entanglement for 1+1 dimensional quantum field theories, especially those that are not conformal but are integrable. In this context, my research has focused on employing one particular technique we have called the branch point twist field approach that we introduced in [Cardy, Castro-Alvaredo, Doyon'07] which I will briefly summarise in my talk. The basic premise of this technique is that measures of entanglement can be expressed in terms of correlation functions of a particular class of local quantum fields and once this is established one may use generalisations of well-known methods to obtain information about the amount of entanglement that can be "distilled" from a particular quantum state and the universal properties of this measure. I will then present some of the main results we have obtained by using this technique and discuss some future developments and open problems.

The work has been carried out in collaboration mainly with Benjamin Doyon and several other collaborators over many years. [View a list of related publications.](#)

Date	Speaker	Seminar
16 May 2018 (Wednesday this week)		COW seminar To be confirmed
1-2 June 2018		ICFT 22 - UK Meeting on Integrable and Conformal Field Theory and Related Topics Speakers include: Kasia Rejzner (York), Ana Ros Camacho (Utrecht), Cornelius Schmidt-Colinet (Munich), Yoh Tanimoto (Rome)
28 June 2018	Lorenzo De Biase (Cardiff)	Generalised braid categorification Ordinary braid group B_n is a well-known algebraic structure which encodes configurations of n non-touching strands (“braids”) up to continuous transformations (“isotopies”). A classical result of Khovanov and Thomas states that this group acts categorically on the space Fl_n of complete flags in C^n . Generalised braids are the braids whose strands are allowed to touch in a certain way. They have multiple endpoint configurations and can be non-invertible, thus forming a category rather than a group. In this talk I will present some progress that have been made towards extending the result of Khovanov and Thomas to the categorification of the generalised braid category.