GREG ANDERSON
University of Minnesota

Ubiquity of algebraic Stieltjes transforms

In joint work with O. Zeitouni we have introduced a "soft" method for proving algebraicity of Stieltjes transforms under hypotheses frequently fulfilled in RMT, based on dimension theory for noetherian local rings. I will explain the method and give several applications.

TEODOR BANICA
Paul Sabatier University, Toulouse

Free probabilistic aspects of quantum algebra

I will discuss a number of computations of measure-theoretic invariants of quantum groups and subfactors, where the central role is played by the free Poisson law. In particular, I will describe a number of explicit probability measures, which appear as versions of the free Poisson law.

DROR BAR-NATAN
University of Toronto

A Very Non-Planar Very Planar Algebra

A long time ago I read somewhere that when you write a scientific article you may use the word "very" very freely. Then at proof-reading you just have to go over everything a second time and scratch out every, really every, occurrence of that word from your article. Anyway, my talk will be about a class of knotted trivalent graphs which is obviously very 3D and nothing planar, yet it forms a planar algebra. Indeed, a very planar algebra - so planar that unlike, say, tangles, it cannot be generalized to higher genus ambient surfaces. The resulting planar algebra is quite useful - it provides a Reidemeister-move planar context for a universal finite type invariant. I'll mention that and explain a bit, but my main reason for talking about this very non-planar very planar algebra is simply that it is amusing.

DIETMAR BISCH
Vanderbilt University

Subfactors and Planar Algebras

The standard invariant of a subfactor has an algebraic-combinatorial description as a planar algebra, a notion due to Jones. We will explain this notion and discuss some of the classification results obtained by Jones and myself.

BENOIT COLLINS
Université Claude Bernard Lyon 1 and Ottawa

Weingarten calculus on enveloping algebras and non-commutative random matrices

We extend the classical Weingarten calculus to the framework of non-commutative random matrix theory. As an application we study and obtain new results about the asymptotic behaviour and fluctuations of some Plancherel measures. We also provide a theoretical explanation for the fact that Plancherel measures behave like invariant random matrices, even at the level of fluctuations. This is joint work with P. Sniady.

VALENTIN FERAY
Université de Marne La Vallée Paris Est

Combinatorial description of Kerov's character polynomials

We will give a combinatorial formula for irreducible character of symmetric groups, using maps. This will help us to understand the combinatorics of Kerov's polynomials, which give the charater values from the free cumulants of the associated Young diagram. In particular we prove the positivity of their coefficient.

PINHAS GROSSMAN
Vanderbilt University

Intermediate subfactors

For a subfactor $N \subset M$ with finite Jones index, the intermediate subfactors $N \subset P \subset M$ correspond to biprojections in the associated planar algebra- 2-boxes which are projections with respect to either shading of the multiplication tangle (Bisch). Bisch and Jones constructed the planar algebra generated by a biprojection, the Fuss-Catalan algebra, which gives a generic (free) composition of two Temperley-Lieb algebras.

The situation with two non-commuting biprojections is more complicated, and other invariants such as angles (Sano-Watatani) come into play. We will discuss some recent results on classifying pairs of non-commuting intermediate subfactors. This is joint work with Vaughan Jones and with Masaki Izumi.

ALICE GUIONNET
Ecole Normale Supérieure de Lyon

Matrix models and Map enumerations

I will review the connection between matrix integrals and the problem of enumerating certain graphs. I will first show how the 'high temperature regime' of Gaussian matrix integrals (joint work with E. Maurel-Segala) and Unitary matrix integrals (joint work with B. Collins and E. Maurel Segala) can be seen as generating function for the enumeration of certain maps. I will then consider the 'low temperature regime' (with E. Maurel Segala and A. Dembo).

VED PRAKASH GUPTA
Institute of Mathematical Sciences

Planar algebra of the subgroup-subfactor

Given a pair of finite groups $H \subset G$, and an outer action α of G on the hyperfinite II_1-factor R, we give an identification between the planar algebra of the subgroup-subfactor $R \rtimes_{\alpha/H} H \subset R \rtimes_{\alpha} G$ and the G-invariant planar subalgebra of the planar algebra of the bipartite graph $\star_n$, where $n = [G : H]$. The crucial step in this identification is an exhibition of a model for the basic construction tower, and thereafter of the standard invariant, of $R \rtimes_{\alpha/H} H \subset R_\alpha \rtimes G$ in terms of operator matrices.

We also obtain an identification between the planar algebra of the fixed algebra subfactor $R^G \subset R^H$ and the G-invariant planar subalgebra of the planar algebra of the 'flip' of $\star_n$.

UFFE HAAGERUP
University of Southern Denmark

Unbounded R-diagonal elements and applications to invariant subspaces.

In two recent joint papers (Math. Scand. 2007 and preprint, math arxiv, 2006) Hanne Schultz and I define and study unbounded R-diagonal operators and use them as a technical tool to construct spectral subspaces for general operators T in II_1 factor. Our key example is the quotient $z = x/y$ of two *-free circular operators (x, y). The operator z is in $L^p(M, tr)$ $(M = W * (x, y))$ for $0 < p < 1$, but not for $p \geq 1$. Moreover, if T is an operator in a larger II_1 factor N, such that T is *-free from (x, y), then the perturbation $T' = T + az$ $(a > 0)$ of T has very nice properties: Its Brown measure can be explicitly computed and it converges to the Brown measure of T for $a- > 0$. Moreover the resolvent of T', $R(s) = (s1 - T')^{-1}$ is in $L^p(N, tr)$ for $0 < p < 1$, and it is a Lipshitz map for $0 < p < 2/3$. The latter property is crucial for our construction of spectral

(T-invariant) subspaces $K(T, B)$ for every operator T in a II_1 factor and every Borel set B in the complex plane.

VAUGHAN JONES
University of California, Berkeley

The graded algebras of a planar algebra.
(Joint with A. Guionnet and D. Shlyakhtenko.)

Inspired by random matrix work of A. Guionnet and D. Shlyakhtenko we define a trace on the graded algebra of a planar algebra and show that the GNS algebra is a factor which affords a subfactor realising the planar algebra we started with. This gives an alternative proof of an old result of S. Popa. The various other graded algebra structures, with slightly modified traces, give the tower obtained by iterating the basic construction. There is a matrix model for these traces as the large N limit of certain Wishart matrices.

GREG KUPERBERG
University of California at Davis

Quantum central limit theorems

tba

ZEPH LANDAU
The City College of New York

Quantum Computation, the Jones Polynomial, and Tensor networks

Relatively recent results connected the study of quantum computation to the approximation of the value of the Jones polynomial of a braid at certain parameters.

Specifically it was shown that a certain approximation was a complete problem for quantum computation: i.e. this problem captured the complete power of a quantum computer.

More recently, work has shown a connection between quantum computation and the approximation of the Tutte polynomial that has a somewhat surprising "non-unitary" component to it.

In this talk, we'll present ongoing work that presents a quantum computer as an approximator of tensor networks. This geometric vision will be natural (for good reason) to those familiar with planar algebras or statistical physics models. We'll connect this point of view to the previously mentioned results, point to new directions, and discuss natural questions that result.

No specialized knowledge of any of the words mentioned above will be assumed.

ALEXANDRU NICA
University of Waterloo

Evolution towards $\boxplus$-infinite divisibility in several variables

In this talk I will discuss a transformation defined on a space of multi-variable non-commutative distributions, which converts free Brownian motion into a process evolving towards infinite divisibility with respect to free additive convolution. The emphasis of the talk will be on combinatorial ideas, illustrating how non-crossing partitions can be used to obtain results about free random variables.

SANDRINE PÉCHÉ
University of Grenoble

Universality results for the largest eigenvalue of sample covariance matrices

we consider XX^*, where X is a $N \times p$ random matrix with i.i.d. entries. We assume that these entries are centered, symmetrically distributed and have sub-Gaussian tails. Then we prove that the largest eigenvalues exhibit Tracy Widom fluctuations if $p/N \to \gamma \in [0, \infty]$, extending a previous universality result of A. Soshnikov.

DIMA SHLYAKHTENKO
University of California, Los Angeles

Free stochastic calculus and its applications (joint with V. Jones and A. Guionnet)

(Based on joint work with A. Guionnet and V. Jones) We discuss some applications of free stochastic calculus to the following areas (i) random matrix models coming from locally convex potentials; (ii) estimates for free entropy dimension and (iii) random matrix models occuring in relation to Jones planar algebras.

PIOTR ŚNIADY
Wroclaw

Free probability and asymptotic representation theory of symmetric groups.

We study the sequence of the symmetric groups S_n and we ask questions about the asymptotic behavior of a given sequence of representations ρ_n (where ρ_n is a representation of S_n). Explicit answers for such questions are usually well-known, however they are not suitable for the asymptotic setup. However, it turns out that free probability provides very nice tools to study such asymptotic questions.

ALEXANDER SOSHNIKOV
University of California, Davis

Spectral properties of Large RandomMatrices with Independent Non-Gaussian Entries

In the beginning of the talk, we will give an exposition of the known results about the spectral properties of random Wigner matrices. The main part of the talk will be devoted to our joint results with Sandrine Peche about the largest eigenvalues of Random Wigner matrices with non-symmetrically distributed entries.

ROLAND SPEICHER
Queen's University

Free probability and non-crossing partitions

This talk will give a survey on free probability theory, with an emphasis on its combinatorial description in terms of non-crossing or planar diagrams.

TOUFIC SUIDAN
University of California Santa Cruz

Fluctuations in the symmetric PNG process with a source

I will present several results on the height fluctuations in the symmetric PNG model with a wall and a source. This is joint work with J. Baik, A. Borodin, and E. Rains.

BALINT VIRAG
University of Toronto

Continuum limits of random matrices

The point process limits of random eigenvalues for beta-ensembles can be understood by taking continuum limits of the random matrix. In the bulk, the limit is the sine point process. It is shown to be a simple functional of hyperbolic Brownian motion. On the edge, the Tracy-Widom limits are given by the eigenvalues of the Airy differential operator plus white noise.

DAN-VIRGIL VOICULESCU
University of California, Berkeley

Aspects of free analysis

I will present aspects of the highly noncommutative analysis of the free difference quotient derivation and of the relation to free entropy and random matrix models.

KEVIN WALKER
Project Q, Microsoft, UCSB

TQFT completions of the annular Temperley-Lieb category

We study the completion of the annular Temperley-Lieb category (with loop value d ¿ 2) given by the corresponding topological quantum field theory. Various familiar objects arise from these completions, including semi-circular distributions, free cumulants and free products, and the irrational rotation algebra. (Joint work with David Sherman.)

FENG XU
University of California, Riverside

On representing some lattices as lattices of intermediate subfactors of finite index

In this talk we will discuss our recent result on representing some very simple lattices as lattices of intermediate subfactors of finite index. These lattices were conjectured among the simplest lattices not realized by intervals of group-subgroup lattices in a finite group. The subfactors which realize these lattices are orbifolds of Jones-Wassermann subfactors from conformal field theory. We will sketch a proof of this result, with emphasize on diagrammatic arguments which partially motivated the proof.

OFER ZEITOUNI
University of Minnesota

Consequences of ergodicity for some translation invariant determinantal processes and their approximations

It has long been recognized that for the GUE, the asymptotic size of the gap at 0, the location of the smallest positive eigenvalue, the (local) empirical measure of spacings between eigenvalues in the bulk, and similar quantities are all related. The “folklore” proof uses combinatorics and inclusion-exclusion relations, but is not completely transparent. I will describe an alternative approach, based on the fact that the eigenvalues process is determinantal with a limiting kernel, the sine kernel, that is shift invariant.