

Mathematics Department Colloquium

Organizer: Vaughan Jones

Thursday, 4:10–5:00pm, 60 Evans

April 12 **Alice Guionnet**, Ecole Normale Supérieure, Lyon. Visiting Berkeley

Matrix models, enumeration of maps and free probability.

Computation of Gaussian moments are well known to be related with the enumeration of graphs, as shown by Wick's formula and pictorially represented by Feynmann diagrams.

't Hooft proved in the seventies that moments of large Gaussian matrices are more specifically related with the enumeration of maps (which are connected graph embedded into a surface) sorted by their genus. Since then, matrix models (i.e. matrix integrals) have been intensively used in physics to analyze a wide class of combinatorial problems.

In this talk we shall describe more precisely the relation between matrix models as introduced by 't Hooft and the problem of the enumeration of maps, first tackled by Tutte in the sixties.

We shall then show that these formal computations can be proved to hold in the limit where the size of the matrices goes to infinity, in a 'high temperature' regime. Free probability then appears as a natural framework to study the combinatorics of planar maps. We shall discuss how the matrix model approach can help to solve the combinatorial problems.