# SEMPARIS – Séminaires en région parisienne

http ://string.lpthe.jussieu.fr/semparis/

## Cours

**Vendredi 30 Janvier 2015, 10 :00**
IPHT, Salle Claude Itzykson, Bât. 774, Orme des Merisiers
Domaines : hep-th—physics

Titre : *Random matrices (4/6)*

Orateur : **Bertrand Eynard ( IPhT )**

Résumé : *Random matrices have become an important tool in mathematics and physics.*

*Their universality laws are ubiquitous, from heavy nuclei energy levels, to string theory, statistical physics, finance, biology, and communication networks. They are also a manageable prototype of integrable systems, on which many ideas on integrability can be tested, understood or even predicted. They play an important role in combinatorics and statistical physics, and they generate Feynman graphs which provide a discrete model of two-dimensional gravity. They are closely related to the theory of orthogonal polynomials. And they play a key role in string theory, mirror symmetry and algebraic geometry.*

*The goal of these lectures is to introduce many of the techniques developed over several decades to handle random matrices. The plan is :*
*1. Introduction : what for and where do you encounter random matrices. The various ensembles of random matrices, their applications, their universality.*
*2. Feynman graph expansion, notion of "formal integrals", combinatorics of maps, statistical physics, string theory.*
*3. Solving : the saddle point approximation, the Coulomb gas.*
*4. Loop equation method, link with algebraic geometry.*
*5. Orthogonal polynomials method, a window into the realm of integrability.*
*6. Beta matrix models.*
*7. Angular integrals.*
*8. More sophisticated examples : 2-matrix models, O(n) model, etc.*