Cours de physique théorique de Saclay

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Orme des Merisiers Salle Claude Itzykson, Bât. 774

Introduction to Topological Recursion

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Videoconference: subscribe to the course newsletter to receive links

Abstract:
Topological Recursion is a mathematical tool. From an initial data S, called the spectral curve, the recursion produces a sequence $\omega_{g,n}(S)$ indexed by two integers g,n. These sequences have many applications that range from string theory to random matrices, statistical physics on a random lattice, integrable systems, WKB asymptotics, CFT, ... We shall introduce Topological Recursion by examples and concrete applications, and mention some long-reach issues.

Plan:

1) Introduction by examples of spectral curves: random matrix spectral densities (semi-circle $y = \sqrt{1-x^2}$), the Witten-Kontsevich curve ($y = \sqrt{x}$), and the Mirzakhani's curve ($y = \sin\sqrt{x}$), and their applications, in particular the volumes of the space of hyperbolic surfaces, the Mirzakhani's recursion.

2) Going from examples to general Topological Recursion. Practical methods for computing Topological Recursion, in particular graphical methods, and general properties.

3) Link to the geometry of surfaces: moduli space of Riemann surfaces, cohomological field theories, towards string theory.

4) Topological Recursion as a powerful method to compute WKB series. Link to differential equations and integrable systems.
