

# SEMPARIS – Séminaires en région parisienne

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

## Cours

**Vendredi 30 Septembre 2022, 10 :00**

IPHT, Salle Claude Itzykson, Bât. 774

Domaines : physics

Titre : *Introduction to Topological Recursion*

Orateur : **Bertrand Eynard ( IPhT )**

Résumé : *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.*

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