

## The 14th Takagi Lectures

November 15, 2014 (Sat) 17:05–18:05

November 16, 2014 (Sun) 15:20–16:20

Graduate School of Mathematical Sciences

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# Random Matrices and Free Analysis

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### Abstract

We describe the Schwinger–Dyson equation related with the free difference quotient, as encountered in the enumeration of planar maps, free probability, random matrices or particles in repulsive interaction. In these lecture notes, we shall discuss how this equation can uniquely define the system and lead to deep properties such as existence of transport maps between solutions, leading to isomorphisms between related algebras. This analysis can be extended to systems which approximately satisfy these equations, such as random matrices or Coulomb gas interacting particle systems, yielding topological expansions and universality for the fluctuations of the eigenvalues.