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Junior Prize II - Alessandro Giacchetto

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From matrix models to LG gravity: the simplest gauge/string duality

Abstract: Matrix models provide one of the oldest examples of a genus expansion suggestive of an underlying string theory, yet the identification of the corresponding worldsheet description has remained subtle. In this talk, I will explain how every one-cut Hermitian matrix model admits an exact reformulation as a closed string theory whose worldsheet dynamics is that of a B-twisted Landau–Ginzburg model coupled to two-dimensional topological gravity. The construction works directly in the conventional 't Hooft limit, without invoking any double-scaling limit. The key ingredient is the spectral curve emerging from the large-N loop equations. I will show how the universal recursive structure governing matrix model correlators is naturally identified with the gravitational recursion relations of the worldsheet theory. In this framework, branch points of the spectral curve correspond to critical points of the Landau–Ginzburg superpotential, and matrix model observables map to tautological cohomology classes on the moduli space of curves. This provides a concrete and fully controlled example of gauge/string duality, in which the closed string theory and its worldsheet path integral are made completely explicit. Based on a work in progress with R. Gopakumar and E. Mazenc.