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A Resurgence of Negativity in Large N Duality

Friday 6 September 2024 16:00 (30 minutes)

The large N expansion yields an asymptotic series. Standard (exponentially suppressed) nonperturbative corrections associated with this series are driven by eigenvalue tunneling. However there are equally relevant exponentially-enhanced nonperturbative-corrections driven by anti-eigenvalue tunneling, which play a key role in describing the asymptotic properties of the large N expansion, as well as the physics of the large N theory across the complex 't Hooft-coupling plane. The same holds true for the string theoretic free energy, where there are now both D-branes and negative-tension D-branes contributing to both the asymptotics and the physics of rather generic problems. After discussing these new nonperturbative effects and the role they play, we turn to their consequences. Partition functions of very generic matrix models and non-critical string theories (with arbitrary KdV times) may be written in closed-form (starting off from string equations alone) via the use of resurgence, transseries, and the aforementioned complete nonperturbative contributions. These have the natural form of Nekrasov-Okounkov dual partition functions, and their associated complete Stokes data can be analytically computed (anywhere on the KdV hierarchy). By examining resonant (kernel) directions in the transseries, a (dual) description of topological strings emerges, which allows for the computation of Argyres-Douglas observables again starting-off solely from string equations (both differential/double-scaled and finite-difference/off-critical). These results for the free energy and partition function may open the door to the exact nonperturbative computation of wave-functions and multi-resolvent operators, eventually fully solving large classes of matrix models and non-critical string theories nonperturbatively.

Link to publication (if applicable)

2210.13479 + 2301.05214 + upcoming publications this summer.

Author: PINA SCHIAPPA DE CARVALHO, Ricardo (Universidade de Lisboa (PT))

Presenter: PINA SCHIAPPA DE CARVALHO, Ricardo (Universidade de Lisboa (PT))

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