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Main Lecture 3: Holomorphic Floer Theory and Resurgence (1/3)

Tuesday, June 6, 2023 10:00 AM (1 hour)

The notion of resurgence ,i.e. the property of a divergent series to have endless analytic continuation of its Borel transform, is due to Jean Écalle. Recently it became clear that the resurgence can be approached via an a priori different notion of analytic wall-crossing structure. The latter concept was defined and studied by Maxim Kontsevich and myself with the original motivation coming from Donaldson-Thomas theory and theory of complex integrable systems (see arXiv: 0811.2435, 1303.3253, 2005.10651).
In my lecture course I plan to discuss a source of analytic wall-crossing structures coming from symplectic topology. More precisely it is the Floer theory in the framework of complex symplectic manifolds. When we started to work on it in 2014 we called it "Holomorphic Floer Theory".
Central part of the Holomorphic Floer Theory is played by the generalized Riemann-Hilbert correspondence which relates Fukaya categories (the latter notion is central in the Floer theory of real symplectc manifolds) with the categories of holonomic deformation-quantization modules (the latter is a generalization of the notion of holonomic D-module).
I am going to explain in what way our conjectural Riemann-Hilbert correspondence is related to resurgence of perturbative expansions arising in mathematics and mathematical physics. Examples include exponential integrals in finite and infinite dimensions (e.g. partition function of the complexified Chern-Simons theory) and WKB expansions of wave functions associated with quantum spectral curves. In these examples we deal with the simplest non-trivial case of Holomorphic Floer theory related to a pair of complex Lagrangian submanifolds of a complex symplectc manifold.

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