Titles and Abstracts

Dylan Allegretti: ***Exact WKB analysis and Riemann-Hilbert problems***

Abstract:

As part of their work on the physics of N=2 field theories in four dimensions, Gaiotto, Moore, and Neitzke described an interesting class of Riemann-Hilbert problems. More recently, Bridgeland studied a related class of Riemann-Hilbert problems arising in a particular limit known as the conformal limit. In this talk, I will explain how tools from exact WKB analysis can be used to solve Bridgeland's Riemann-Hilbert problem in a large class of examples associated to quadratic differentials. This gives a mathematically rigorous approach to the construction of Gaiotto, Moore, and Neitzke in the conformal limit.

Jørgen Ellegaard Andersen: ***Geometric Recursion***

Abstract:

We shall review the geometric recursion and its relation to topological recursion. In particular, we shall consider the target theory of continuous functions on Teichmüller spaces and we shall exhibit a number of classes of mapping class group invariant functions, which satisfies the geometric recursion. Many of these classes of functions are integrable over moduli spaces and we prove that these averages over moduli spaces satisfy topological recursion. The talk will end with some future perspectives of applications of geometric recursion. The construction of geometric recursion and the results relating it to topological recursion is joint work with Borot and Orantin.

Anna Barbieri: ***A (quantum) Riemann-Hilbert problem in Donaldson-Thomas theory***

Abstract:

I will discuss a Riemann-Hilbert problem defined from the output of the generalized Donaldson-Thomas theory on a particularly simple CY3 category, and its solution in the semi-classical limit and refined version. Roughly speaking, this example corresponds to the DT theory associated to the quiver A1. Based on a joint work with Bridgeland and Stoppa.

Florian Beck: ***Mirror symmetry of Calabi-Yau manifolds, parabolic Higgs bundles and opers***

Abstract: TBA

Gaëtan Borot: ***Constructing W-algebras modules from topological recursion***

Abstract:

I will explain how to construct certain highest weight modules for W-algebras of type ADE at self-dual level whose generating vector is computed by the topological recursion. One expects these generating vectors to have an enumerative interpretation (sometimes known, sometimes conjectural). For gl_r, we give a correspondence between Bouchard-Eynard topological recursion on spectral curves with arbitrary ramification and these W(gl_r)-modules, but (surprisingly) we find some admissibility criterion for the definition of topological recursion to be well-posed.
This is based on a joint work with Bouchard, Chidambaram, Creutzig, Noshchenko.

Tom Bridgeland: ***Donaldson-Thomas invariants and the deformed cubic oscillator***

Abstract :

I will report on a project which aims to encode the DT invariants of a CY3 triangulated category in a geometric structure (called a Joyce structure) on its space of stability conditions. In the talk I will focus on the case of the A2 quiver, where everything is quite explicit, and the relevant Joyce structure can be built from the monodromy map for the deformed cubic oscillator.

Ioana Coman: ***Topological strings from quantum curves and integrability***

Abstract:

We use a quantization of the Seiberg-Witten curve for N = 2 SUSY gauge theories of class S, together with the corresponding isomonodromic tau function, to give a geometric characterisation of topological string partition functions for the local CY used in the geometric engineering of these class S theories.
From the evidence we have gathered thus far, it appears possible to define a normalised tau function as a section of a line bundle over the moduli space of quantum curves, such that expansions of this tau function of a very particular type and in appropriate sets of coordinates generate the topological string partition functions of class S theories.

Bertrand Eynard: ***Topological recursion, integrable systems and CFT***

Abstract:

We review how topolgical recursion can be used to describe the heavy limit of a conformal field theory (CFT). In fact to any spectral curve one can associate a set of "amplitudes", that obey OPE and Ward identities of some CFT, to each spectral curve a CFT.
The construction also makes the link with integrable systems and Hitchin systems.

Albrecht Klemm: ***Topological String on elliptic CY 3-folds with N-sections and Jacobi forms***

Abstract:

The all genus topological string amplitudes on Calabi-Yau 3-folds are generating functions of the symplectic invariants of holomorphic curves. We argue that the Fourier-Mukai transform on the A-model category as well as the holomorphic anomaly of the B-model restrict these amplitudes to be meromorphic Jacobi-forms of Gamma_1(N) subgroups of SL(2,ZZ). Vanishing conditions and in the non-compact case Nakajima's blow up equations allow to fix the amplitudes explicitly.

Pietro Longhi: ***BPS counting with exponential networks***

Abstract:

Spectral networks compute certain enumerative invariants associated with Hitchin systems, by focusing on the interplay of certain geometric and combinatorial data within them. In physics, they count BPS states of class S theories through 2d-4d wall crossing. I will describe a 3d-5d uplift of this based on exponential networks, that computes generalized Donaldson-Thomas invariants of toric Calabi Yau threefolds. Time permitting, I will comment on connections to relativistic deformations of integrable systems, and the role of 3d tt* geometry, which appear as a counterpart of the Hitchin system in five dimensions.

Marcos Marino: ***Spectral problems from quantum curves***

Abstract:

Algebraic curves appearing in local mirror symmetry and supersymmetric gauge theory can be quantized and lead to operators on the real line. It turns out that the underlying topological string/gauge theories provide tools to solve the spectral problems defined by these operators. I will focus on two different tools.
First of all, the resurgent properties of the quantum periods appearing in the exact WKB method are determined by the BPS spectrum of the theory. Second, the spectral determinant of the operators can be computed exactly (albeit conjecturally) from topological string amplitudes and instanton counting.
These ideas provide powerful methods to solve exactly many old and new problems in one-dimensional quantum mechanics, and they lead to new insights on the non-perturbative structure of topological string theory.

Gregory Moore: ***Branes And Interfaces For 2D Landau-Ginzburg Models With Twisted Masses***

Abstract:

This talk will be a progress report on work in progress with Ahsan Khan.
The ultimate goal of the project is to understand a "categorification" of BPS indices (and their wall-crossing) in both two and four dimensional supersymmetric QFT. In 2015 Gaiotto, Moore, and Witten (GMW) approached the problem of the categorification of BPS indices in massive two-dimensional models with (2,2) supersymmetry by constructing an A-infinity 2-category of interfaces (aka domain walls) between such theories using a "web formalism." An important first step in generalizing to 2d-4d systems is to incorporate "twisted masses" into the two-dimensional setting. The talk will describe some results on the generalization of the GMW discussion to include twisted masses.

Motohico Mulase: ***Holomorphic Lagrangian geometry of Hitchin and de Rham moduli spaces***

Abstract:

Lagrangians in moduli spaces of local systems play an important role in many fronts, in particular, from the point of view of quantization. In this talk I will focus on holomorphic Lagrangians that are assembled into a conjectural foliation through variation of Hodge structures. Still no general theorem exists on this holomorphic foliation. I will talk about what is conjectured, and report what is happening in simple cases based on my joint work with Brown and Dumistrescu.

Andrew Neitzke: Spectral networks, exact WKB for the T3 equation, and q-abelianization

Abstract:

I will give a quick account of the notion of spectral network and then discuss two recent applications. The first application is to the higher-rank version of the exact WKB method, which we treat in the test case of a third-order differential equation on CP^1 with three regular singularities; this is joint work with Lotte Hollands. The second application is to a map between skein algebras, which can be thought of as a quantization of abelianization, generalizing earlier constructions by Bonahon-Wong, Gabella and Galakhov-Longhi-Moore; this is joint work in progress with Fei Yan.

Johannes Walcher: ***Exponential networks. First steps.***

Abstract: TBA