Topological String Theory and Related Topics

Report of Contributions

https://indico.cern.ch/e/topologicalstrings19

Contribution ID: **1** Type: **not specified**

A review on non-perturbative topological string theory and its applications

Monday 3 June 2019 09:30 (1 hour)

In this talk I will review a non-perturbative definition of topological string theory and discuss some of its applications.
I will explain how this construction is related to blowup equations (see talk by Gu), the Hofstadter butterfly problem (see talk by Hatsuda) and the theory of Painlevé equations (see talks by Marshakov, Teschner and Del Monte

Presenter: GRASSI, Alba (U)

Contribution ID: **2** Type: **not specified**

Electrons on the honeycomb lattice and topological strings

Monday 3 June 2019 11:00 (30 minutes)

I would like to briefly review our recent works on an application of topological string theory to 2d electron system. I will explain how to generalize this idea to the case of honeycomb lattice.

Presenter: HATSUDA, Yasuyuki (Department of Physics, Rikkyo University)

Contribution ID: **3** Type: **not specified**

Topological String and String effective couplings

Tuesday 4 June 2019 09:00 (1 hour)

We will review the relation between Topological String Theory and the physical string couplings in the context of Type II string theories. Mapping the problem to physical string couplings allows one to study their dual heterotic theories that give rise to Schwinger like formulae for the singularity structures due to the appearance of massless BPS states. In this context we also discuss the refined topological string and present some new perspectives and open questions.

Presenter: NARAIN, Kumar (ICTP)

Contribution ID: **4** Type: **not specified**

The Geometry Behind Topological Amplitudes

Tuesday 4 June 2019 10:30 (30 minutes)

Presenter: ANGELANTONJ, Carlo (Universita e INFN Torino (IT))

Contribution ID: **5** Type: **not specified**

TBA

Presenter: ANGELANTONJ, Carlo (Universita e INFN Torino (IT))

Contribution ID: **6** Type: **not specified**

Topological strings, knots and quivers

Wednesday 5 June 2019 09:00 (1 hour)

I will review a recently discovered correspondence between
topological strings (and knots and their invariants in particular) and quiver representation theory.

Presenter: SULKOWSKI, Piotr

Contribution ID: **7** Type: **not specified**

Identifying matter in F-theory via the topological string

Wednesday 5 June 2019 10:30 (30 minutes)

Presenter: KASHANI-POOR, Amir-Kian

Contribution ID: **8** Type: **not specified**

Resurgence, Matrices, and Strings (TH Colloquium)

Wednesday 5 June 2019 14:00 (1h 15m)

Perturbation theory is generically divergent, leading to series with zero radius of convergence. When such asymptotic perturbative-series are resurgent, this problem can be tackled by extending the perturbative series into a non-perturbative trans-series, in a specified fashion. Resurgent trans-series may then be used to go beyond perturbation theory in generic problems across theoretical physics, and address diverse non-perturbative phenomena. This colloquium will cover a brief introduction to resurgence and trans-series, with some illustrative applications within (zero-dimensional) gauge theories (i.e., matrix models) and (topological) string-theoretic settings

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

Contribution ID: **9** Type: **not specified**

Topological String on Elliptic Calabi-Yau 3-folds and 6d SCFT

Thursday 6 June 2019 09:00 (1 hour)

We describe four methods to solve the topological string on elliptic Calabi-Yau manifolds and its relation to 6d SCFT.

Presenter: KLEMM, Albrecht (Institut fuer Theoretische Physik)

Contribution ID: **10** Type: **not specified**

BPS variation of Hodge structure

Thursday 6 June 2019 10:30 (30 minutes)

The existence, decay and formation of BPS bound-states in N=2 theories are controlled by the central charge function through the notion of Pi-stability. In this talk I will describe the variation of the central charge over the moduli space of a given theory introducing a notion of BPS variation of Hodge structure. This description leads to exact results, giving exact descriptions of the walls of marginal stability and sheds new light on the attractor flow as a tool to solve the BPS problem. This is based on joint work with Florian Beck, Anna Biggs and Daniel Bryan.

Presenter: ALIM, Murad (University of Hamburg)

Contribution ID: **11** Type: **not specified**

TBA

Presenter: IQBAL, Amer

Contribution ID: **12** Type: **not specified**

Triality in Little String Theories

Friday 7 June 2019 09:00 (45 minutes)

I discuss a class of little string theories (LSTs) with eight supercharges on the world-volume of N M5-branes probing a transverse Z_M orbifold. These M-brane configurations compactified on a circle are dual to M D5-branes intersecting N NS5-branes on Tˆ2 x Rˆ{7,1} as well as to F-theory compactified on a toric Calabi-Yau threefold X_{N,M}. I argue that the Kähler cone of X_{N,M} admits three regions associated with weakly coupled quiver gauge theories of gauge groups [U(N)]ˆM, [U(M)]ˆN and [U(NM/k)]ˆk where k=gcd(N,M). These provide low-energy descriptions of different LSTs. The duality between the first two gauge theories is well known and is a consequence of the S-duality between D5- and NS5-branes or the T-duality of the LSTs. The triality involving the third gauge theory is new and I demonstrate it using several examples. Finally, I argue that triality implies a dihedral symmetry for the theories with M=1, which acts intrinsically non-perturbative from a gauge theory perspective.

Presenter: HOHENEGGER, Stefan (Centre National de la Recherche Scientifique (FR))

Contribution ID: **13** Type: **not specified**

Chiral algebras, instanton strings, and hidden symmetries

Friday 7 June 2019 10:30 (45 minutes)

I will discuss a class of 2d NLSMs which describe D3 branes wrapped on a two-sphere and probing an F-theory singularity. The chiral algebras of the NLSMs turn out to be a very useful tool. For one choice of twisting, the resulting NLSMs describe 6d instanton strings, and the chiral algebras encode BPS invariants of elliptic threefolds. A different choice of twist leads to NSLMs on minuscule varieties; in one notable example, the chiral algebra of the NLSM describes the ghost sector of the pure spinor superstring, and our construction reveals the existence of a hidden E6 symmetry.

Presenter: LOCKHART, Guglielmo

Contribution ID: **14** Type: **not specified**

Cluster integrable systems, supersymmetric gauge theories and topological strings

Monday 10 June 2019 09:00 (1 hour)

Presenter: MARSHAKOV, Andrei (Center for Advanced Studies, Skoltech)

Contribution ID: **15** Type: **not specified**

Painlevé/Gauge theory correspondence on the torus

Monday 10 June 2019 10:30 (30 minutes)

In the last few years there have been many new results connecting (linear quiver) N=2 class S theories, and the topological strings that engineeer them, to the theory of isomonodromic deformations on the sphere and their q-deformations.
The aim of this talk is to show how this connection can be extended beyond the case of genus zero, which corresponds to circular quiver gauge theories, including adjoint hypermultiplets in the description. We will see how the genus one case displays new qualitative features that are absent on the sphere, due to the possibility of various inequivalent vector bundles, and how this actually provides new interesting relations satisfied by the 4d all genus Topological String partition function.

Presenter: DEL MONTE, Fabrizio (SISSA, Trieste)

Contribution ID: **16** Type: **not specified**

Partition functions from quantum curves

Monday 10 June 2019 11:00 (30 minutes)

In joint work with I. Coman and E. Pomoni we had recently proposed a definition of the topological string
partition functions for the local Calabi-Yau manifolds used in the geometric engineering of N=2, d=4 class S field theories. The main goal of my talk will be to review this proposal, and to explain how the exact WKB method provides a crucial ingredient. We thereby arrive at a fully non-perturbative construction of the partition functions from the classical curves describing the relevant B-model backgrounds.

Presenter: TESCHNER, Joerg (DESY)

Contribution ID: **17** Type: **not specified**

Coffee Break

Contribution ID: **18** Type: **not specified**

The general theory of B-type Landu-Ginburg models

Tuesday 11 June 2019 10:30 (30 minutes)

I give a very brief review of the main points of my recent work on the constructive field theory of the most general class of B-type Landau-Ginzburg models, stressing the conceptually important parts while avoiding most of the mathematical details.

Presenter: LAZAROIU, Calin (Institute for Basic Science, Center for Geometry and Physics)

Contribution ID: **19** Type: **not specified**

Open intersection numbers, matrix models and W-constraints

Tuesday 11 June 2019 11:00 (30 minutes)

In their recent work R. Panharipande, J. Solomon and R.
Tessler constructed intersection theory on the moduli spaces of Riemann surfaces with boundaries. The goal of my talk is to describe the generating function of this theory, which is a simplest example of the open topological string model, in terms of matrix models and integrable hierarchies. The geometrical description of the open theory is much more complicated then the closed one, however, on the level of matrix
models and integrable systems the difference is not so dramatic and the open case can be described by a natural deformation of the Kontsevich-Witten model.

Presenter: ALEXANDROV, Alexander (CGP IBS)

Contribution ID: **20** Type: **not specified**

Bounding Chains in Open Gromov-Witten Theory

Wednesday 12 June 2019 09:00 (1 hour)

I will discuss an approach to establishing the foundations of open Gromov-Witten theory based on bounding chains and Fukaya A-infinity algebras.

Presenter: SOLOMON, Jake (Hebrew University)

Contribution ID: **21** Type: **not specified**

Matrix Factorizations and Homological Mirror Symmetry

Friday 14 June 2019 09:00 (1 hour)

I will review how matrix factorizations can be used to do computations in homological mirror symmetry and show that a crucial ingredient is a generalization of Saito's residue pairings to boundaries.

Presenter: LERCHE, Wolfgang (CERN)

Contribution ID: **22** Type: **not specified**

Periods and quasiperiods of modular forms and the mirror quintic at the conifold

Wednesday 12 June 2019 10:30 (30 minutes)

We exhibit a relation between the analytic continuation of the periods of the mirror quintic to the conifold and periods and quasiperiods of a certain weight 4 Hecke eigenform associated to the mirror quintic. To explain this, we review the theory of periods of modular forms and extend it to quasiperiods.

Presenter: SCHEIDEGGER, Emanuel (Universitaet Augsburg)

Contribution ID: **23** Type: **not specified**

BV quantization and special coordinates in quantum field theory

Thursday 13 June 2019 09:00 (1 hour)

We show that there is a universal algebraic structure, closely related with that of the WDVV equation, governing quantum correlation functions of every quantum field theory based on the BV quantization scheme.

Presenter: PARK, Jae-Suk (Postec)

Contribution ID: **24** Type: **not specified**

Sphere partition function and the refined swampland distance conjecture

Thursday 13 June 2019 10:30 (30 minutes)

The sphere partition function of the gauged linear sigma model computes the exact metric on the Kaehler moduli space of a Calabi-Yau. We use this to test the refined swampland distance conjecture for examples of one-parameter Calabi-Yau threefolds with exotic hybrid points. This is joint work with David Erkinger.

Presenter: KNAPP, Johanna (TU Wien)

Contribution ID: **25** Type: **not specified**

Modularity from Monodromy

Thursday 13 June 2019 11:00 (30 minutes)

We discuss the relation between certain auto-equivalences of the category of B-branes on elliptic Calabi-Yau threefolds and modular properties of the corresponding topological string partition function.
This suggests a geometric explanation and generalization of recent conjectures on the appearance of lattice Jacobi forms.
In particular, we will shed light on the special case where the fibration does not have a section but only multi-sections.

Presenter: SCHIMANNEK, Thorsten (University of Vienna)

Contribution ID: **26** Type: **not specified**

TBA

Presenter: HELLERMAN, Simeon (Institute for Advanced Study)

Contribution ID: **27** Type: **not specified**

Solving refined BPS invariants with blowup equations

Monday 3 June 2019 11:30 (30 minutes)

Presenter: GU, Jie (University of Geneva)

Contribution ID: **28** Type: **not specified**

Gromov-Witten-Floer theory and mirror symmetry

Tuesday 11 June 2019 09:00 (1 hour)

In this talk I will first review the Lagrangian Floer theory in the general context of open-closed TFT in two dimensions and then explain its application to the mirror symmetry of compact toric manifolds. In particular, I will explain construction of a natural isomorphism between the Frobenius manifold structures of the (big) quantum cohomology of a toric manifold and of Saito's theory of singularities of the potential function constructed via the bulk-deformed Floer cohomology. Our proof of the isomorphism involves the open-closed Gromov-Witten theory of one-loop. This talk is based on a series of joint works with Fukaya, Ohta and Ono.

Presenter: OH, Yong-Geun (Postec)