

**HirosiFest @ Caltech**

# **Report of Contributions**

Contribution ID: 3

Type: **not specified**

## Mina Aganagic (Berkeley)

*Thursday 27 October 2022 11:00 (30 minutes)*

[Session Chair: Anton Kapustin (Caltech)]

“Categorification of Chern-Simons link invariants from mirror symmetry”

Contribution ID: 4

Type: **not specified**

## Csaba Csaki (Cornell)

*Thursday 27 October 2022 11:30 (30 minutes)*

[Session Chair: Anton Kapustin (Caltech)]

“Magnetic scattering: pairwise little group and pairwise helicity”

I explain the concept of the pairwise little group which leads to the existence of pairwise helicity for multi-particle states. This pairwise helicity is needed to describe the scattering of magnetically charged particles. I show how to implement pairwise helicity into the spinor-helicity formalism and with its help construct the general 3 point functions. For  $2 \rightarrow 2$  scattering we use the generalization of the partial wave decomposition and derive the famous helicity flip in the lowest partial wave as a simple consequence of a generalized spin-helicity selection rule, as well as the full angular dependence for the higher partial waves. We show a potential resolution of Callan’s long-standing semiton problem in our approach. Finally we show how these pairwise states can be understood dynamically as dressed states which incorporate the effects of soft photons, and provide a novel fully field theoretic derivation of Dirac quantization in terms of a geometric Berry phase.

Contribution ID: 5

Type: **not specified**

## Jaume Gomis (Perimeter)

*Thursday 27 October 2022 13:30 (30 minutes)*

[Session Chair: Oliver DeWolfe (Colorado)]

“Anomalies and Symmetry Fractionalization”

't Hooft anomalies play a central role in informing nonperturbative dynamics.

I will describe how the 't Hooft anomalies of a physical system can depend on additional data, whose physical interpretation we elucidate, and discuss the implications of this for 't Hooft anomaly matching.

Contribution ID: 6

Type: **not specified**

## Dan Freed (UT Austin)

*Thursday 27 October 2022 14:00 (30 minutes)*

[Session Chair: Oliver DeWolfe (Colorado)]

“Topological symmetry in field theory”

Recently there has been lots of activity surrounding generalized notions of symmetry in quantum field theory, including “categorical symmetries”, “higher symmetries”, “noninvertible symmetries”, etc. Inspired by definitions of abstract (finite) groups and algebras and their linear actions, we introduce a framework for these symmetries in field theory and a calculus of topological defects based on techniques in topological field theory. This is joint work with Constantin Teleman and Greg Moore.

Contribution ID: 7

Type: **not specified**

## Tadashi Tokieda (Stanford)

*Thursday 27 October 2022 15:00 (30 minutes)*

[Session Chair: David Simmons-Duffin (Caltech)]

Contribution ID: 8

Type: **not specified**

## Stephen Shenker (physics colloquium)

*Thursday 27 October 2022 16:00 (1 hour)*

[Session Chair: David Simmons-Duffin (Caltech)]

Contribution ID: 9

Type: **not specified**

## Rajesh Gopakumar (ICTS)

*Friday 28 October 2022 09:30 (30 minutes)*

[Session Chair: Spenta Wadia (ICTS)]

### “Deriving the Simplest Gauge-String Duality”

The simplest large  $N$  gauge theory is, arguably, the Gaussian matrix (or more generally, one hermitian matrix) integral. We will explicitly show that arbitrary correlators of single trace operators in this theory (without any double scaling limit) are identical to corresponding physical correlators in a dual topological string description. We will present both a novel A-model dual and also a mirror B-model Landau-Ginzburg description. The equality of correlators arises via open-closed-open string triality and a surprising relation to the  $c=1$  string theory. The goal will be, however, to go beyond demonstrating equality but rather to make the duality manifest. For the B-model description this involves Eynard’s recasting of topological recursion relations in terms of intersection numbers on moduli space. For the A-model this goes through the relation of Gaussian correlators to the special Belyi covering maps or equivalently, discrete volumes of moduli space. Finally, we also briefly mention the significance of these results for the gauge-string duality of  $N=4$  Super Yang-Mills theory. (Based on upcoming works with Edward Mazenc).



Contribution ID: **10**

Type: **not specified**

## Yaron Oz (Tel Aviv)

*Friday 28 October 2022 10:00 (30 minutes)*

[Session Chair: Spenta Wadia (ICTS)]

“Unraveling Turbulence: Modern Viewpoints On An Unsolved Problem”

Fluid turbulence is a major unsolved problem of physics exhibiting an emergent complex structure from simple rules.

We will briefly review the problem and discuss three avenues towards its solution: field theory, holography and machine learning.

Contribution ID: **11**

Type: **not specified**

## Erik Verlinde (Amsterdam)

*Friday 28 October 2022 11:00 (30 minutes)*

[Session Chair: Juan Maldacena (IAS)]

“K3, Topological Strings and the Entropic Principle”

Contribution ID: **12**

Type: **not specified**

## Daniel Harlow (MIT)

*Friday 28 October 2022 11:30 (30 minutes)*

[Session Chair: Juan Maldacena (IAS)]

“Where we are on the black hole information problem”

I’ll give an overview of recent developments on the black hole information problem and a status report.

Contribution ID: **13**

Type: **not specified**

## Igor Klebanov (Princeton)

*Friday 28 October 2022 13:30 (30 minutes)*

[Session Chair: Sergei Gukov (Caltech)]

“Group Invariant States as Quantum Many-Body Scars”

Contribution ID: 14

Type: **not specified**

## Natalie Paquette (Washington)

*Friday 28 October 2022 14:00 (30 minutes)*

[Session Chair: Sergei Gukov (Caltech)]

“Top-down topological holography & twists on twistor space”

Contribution ID: 15

Type: **not specified**

## Nathan Seiberg (IAS)

*Friday 28 October 2022 15:00 (30 minutes)*

[Chair: Christoph Keller (Arizona)]

“Symmetries and Anomalies on the Lattice”

Contribution ID: **16**

Type: **not specified**

## Washington Taylor (MIT)

*Friday 28 October 2022 15:30 (30 minutes)*

[Chair: Christoph Keller (Arizona)]

“From geometry to 4D physics”

New insight into the topological structure of Calabi-Yau fourfolds provides a useful tool for organizing our understanding of chiral matter and how the Standard Model of particle physics can arise in the geometrical framework of F-theory. This work ties into a number of themes that have played an important role in Hiroshi Ooguri’s work over the course of his career.

Contribution ID: 17

Type: **not specified**

## Herman Verlinde (Princeton)

*Friday 28 October 2022 16:20 (30 minutes)*

[Chair: Masahito Yamazaki (Kavli IPMU)]

“Some new observations about black hole partition functions”



Contribution ID: **18**

Type: **not specified**

## Jan de Boer (Amsterdam)

*Thursday 27 October 2022 09:30 (30 minutes)*

[Session Chair: John H. Schwarz (Caletch)]

“quantum gravity and statistical physics”

Contribution ID: 19

Type: **not specified**

## Nathan Berkovits (ICTP-SAIFR, Sao Paulo)

*Thursday 27 October 2022 10:00 (30 minutes)*

[Session Chair: John H. Schwarz (Caltech)]

“D=5 Holomorphic Chern-Simons and the Pure Spinor Superstring”

Superstring amplitudes can be computed using either the  $N=1$  worldsheet supersymmetric prescription of the RNS formalism or the twisted  $N=2$  worldsheet supersymmetric prescription of the pure spinor formalism. Although all amplitudes computed using the two prescriptions coincide, there is still no equivalence proof and multiloop computations contain different subtleties in the two prescriptions. D=5 holomorphic Chern-Simons amplitudes can also be computed using either  $N=1$  or twisted  $N=2$  worldsheet supersymmetric prescriptions, and provide insights for an equivalence proof of the RNS and pure spinor prescriptions.

Contribution ID: **21**

Type: **not specified**

## Spenta Wadia (ICTS)

*Thursday 27 October 2022 18:30 (30 minutes)*

Banquet speech