

# **École Normale Supérieure Summer Institute 2024**

## **Rapport sur les contributions**

ID de Contribution: 2

Type: **Non spécifié**

## Nonrelativistic conformal field theory

*samedi 22 juin 2024 11:00 (1 heure)*

We will review the notions of Schrödinger symmetry and nonrelativistic conformal field theory, in particular the restrictions that Schrödinger symmetry imposes on correlation function and the operator-state correspondence. We will then consider the most important example of NRCFT — fermions at unitarity, and derive physical consequences of the formalism.

**Orateur:** Prof. SON, Dam

**Classification de Session:** Formal theory

ID de Contribution: 3

Type: **Non spécifié**

## The dual of semi-classical gravity

*lundi 24 juin 2024 11:00 (1 heure)*

Recent work has produced a consistent picture of the holographic dual description of semi-classical gravity. I will describe this picture, several applications of this picture including the factorization puzzle and the information paradox, and some open questions.

**Orateur:** Prof. DE BOER, Jan

**Classification de Session:** Formal theory

ID de Contribution: 4

Type: **Non spécifié**

## Energy Reflection and Transmission at 2D Holographic Interfaces

*lundi 24 juin 2024 14:00 (1 heure)*

Scattering from conformal interfaces in two dimensions is universal in that the flux of reflected and transmitted energy does not depend on the details of the initial state. In this talk, I will present two gravitational calculations of the energy reflection and transmission coefficients for interfaces with holographic duals. I will first consider a thin-brane holographic toy model which is often used in the context of entanglement islands and black hole evaporation. I will demonstrate that the result for the reflection coefficient there depends monotonically on the tension of the brane. I will then extend the calculation to smooth domain-walls in 3-dimensional gravity. As an application, I will compute the transmission coefficient of a Janus interface in terms of its deformation parameter. I will demonstrate that both results obey bounds derived from the ANEC in conformal field theory.

**Orateur:** Prof. CHAPMAN, Shira**Classification de Session:** Formal theory

ID de Contribution: 5

Type: **Non spécifié**

# The entropy of Holographic CFTs at large charge and angular momentum

*mardi 25 juin 2024 11:00 (1 heure)*

Black holes in  $\text{AdS}_d$  (with  $d \geq 4$ ) are always unstable at large angular momentum, and sometimes unstable at large charge. In this talk we present proposals for the end point of these instabilities. Our constructions suggest new entropy formulae for  $\mathcal{N} = 4$  Yang-Mills in the neighbourhood of extremality, and in particular on the BPS manifold.

**Orateur:** Prof. MINWALLA, Shiraz

**Classification de Session:** Formal theory

ID de Contribution: 6

Type: **Non spécifié**

## **Toward stringy horizons**

*mardi 25 juin 2024 14:00 (1 heure)*

**Orateur:** Prof. LIU, Hong

**Classification de Session:** Formal theory

ID de Contribution: 7

Type: **Non spécifié**

## **A Holographic View of the QCD Axion**

*jeudi 27 juin 2024 11:00 (1 heure)*

**Orateur:** GHERGHETTA, Tony (University of Minnesota)

**Classification de Session:** Phenomenology

ID de Contribution: **8**

Type: **Non spécifié**

## **Gravitational waves from axion strings**

*jeudi 27 juin 2024 14:00 (1 heure)*

**Orateur:** HARDY, Edward

**Classification de Session:** Phenomenology

ID de Contribution: 9

Type: **Non spécifié**

## **Axions from the Quantum Gravity Viewpoint**

*jeudi 27 juin 2024 15:30 (1 heure)*

**Orateur:** REECE, Matt (Harvard)

**Classification de Session:** Phenomenology

ID de Contribution: **10**

Type: **Non spécifié**

## **The Piezoaxionic Effect: dark matter detection and new forces**

*vendredi 28 juin 2024 11:00 (1 heure)*

**Orateur:** MADDEN, Amalia (Perimeter Institute)

**Classification de Session:** Phenomenology

ID de Contribution: 11

Type: **Non spécifié**

## **DETOX haloscope first results**

*vendredi 28 juin 2024 14:00 (1 heure)*

**Orateur:** THERY, Arnaud (ENS)

**Classification de Session:** Phenomenology

ID de Contribution: 13

Type: **Non spécifié**

## **Lower-dimensional gravity, DSSYK and group theory**

*jeudi 20 juin 2024 14:00 (1 heure)*

In this talk, I will report on recent progress in understanding lower-dimensional gravitational models structurally from group theory. The main strength of this approach seems to be its universality in describing different models. In particular, I will discuss how it can be used to argue for a bulk holographic dual of double-scaled SYK (DSSYK) in terms of sine dilaton gravity.

**Orateur:** MERTENS, Thomas (University of Ghent, Belgium)

**Classification de Session:** Formal theory

ID de Contribution: 14

Type: **Non spécifié**

## **Categorical Landau Paradigm**

**Orateur:** SCHAFFER NAMEKI, Sakura (University of Oxford, UK)

ID de Contribution: 15

Type: **Non spécifié**

# The Parisi-Sourlas Uplift and Infinitely Many Solvable 4d CFTs

*jeudi 20 juin 2024 15:30 (1 heure)*

Parisi-Sourlas (PS) supersymmetry is known to emerge in some models with random field type of disorder. When PS SUSY is present the  $d$ -dimensional theory allows for a  $d-2$ -dimensional description. In this paper we investigate the reversed question and we provide new indications that any given  $\text{CFT}_{\{d-2\}}$  can be uplifted to a PS SUSY  $\text{CFT}_d$ . We show that any scalar four-point function of a  $\text{CFT}_{\{d-2\}}$  is mapped to a set of 43 four-point functions of the uplifted  $\text{CFT}_d$  which are related to each other by SUSY and satisfy all necessary bootstrap axioms. As a byproduct we find 43 non trivial relations between conformal blocks across dimensions.

We test the uplift in generalized free field theory (GFF) and find that PS SUSY is a powerful tool to bootstrap an infinite class of previously unknown GFF observables. Some of this power is shown to persist in perturbation theory around GFF.

We explain why all diagonal minimal models admit an uplift and we show exact results for correlators and CFT data of the 4d uplift of the Ising model. Despite being strongly coupled 4d CFTs, the uplifted minimal models contain infinitely many conserved currents and are expected to be integrable.

**Orateur:** TREVISANI, Emilio (CNRS - Sorbonne Université)

**Classification de Session:** Formal theory

ID de Contribution: 16

Type: **Non spécifié**

## **Cryptographic Censorship: A Quantum Complexity Approach to (Quantum) Cosmic Censorship**

Do naked singularities exist as typical states in quantum gravity? Various considerations, from black hole thermodynamics to empirical observations, suggest that the answer is no. Nevertheless, in the past decade, numerous generic solutions to GR in four spacetime dimensions have been found to be likely candidates for naked singularity formation. In this talk, I'll give evidence that such solutions are expected to be in the swampland, and give a theorem that, under certain assumptions, guarantees that event horizons do in fact exist in typical states in quantum gravity in the context of AdS/CFT.

**Orateur:** ENGELHARDT, Netta (MIT)

**Classification de Session:** Formal theory

ID de Contribution: 17

Type: **Non spécifié**

## Arithmetic Chaos Inside Black Holes

*vendredi 21 juin 2024 11:30 (1 heure)*

It has been known for over 50 years that spacetime dynamics becomes chaotic in the approach to singularities. Furthermore, the classical gravitational dynamics exhibits remarkable number-theoretic properties known as arithmetic chaos. I will review these facts and give an explicit realisation of these phenomena in the interior of an asymptotically AdS black hole. I will discuss possible implications for the nature of black hole singularities and black hole thermodynamics.

**Orateur:** HARTNOLL, Sean (University of Cambridge)

**Classification de Session:** Formal theory

ID de Contribution: 18

Type: **Non spécifié**

## Tracking celestial and Carrollian theories

*vendredi 21 juin 2024 14:30 (1 heure)*

In this talk, I will present recent developments towards formulating a holographic correspondence for asymptotically flat spacetimes. In particular, I will discuss the role of newly uncovered symmetries in the so-called celestial and Carrollian holographic proposals.

**Orateur:** DONNAY, Laura (SISSA)

**Classification de Session:** Formal theory

ID de Contribution: **19**

Type: **Non spécifié**

## **AdS3/CFT2 @ free point and beyond**

*mercredi 26 juin 2024 09:00 (25 minutes)*

**Orateur:** GABERDIEL, Matthias (ETH Zurich)

**Classification de Session:** Costas Bachas day

ID de Contribution: **20**

Type: **Non spécifié**

## **Costas Bachas: (personal) strings**

*mercredi 26 juin 2024 09:25 (25 minutes)*

**Orateur:** LUEST, Dieter (Max-Planck-Institut fuer Physik, Ludwig-Maximilians-Universitaet)

**Classification de Session:** Costas Bachas day

ID de Contribution: 21

Type: **Non spécifié**

## Two Tales about 2d CFTs

*mercredi 26 juin 2024 09:50 (25 minutes)*

**Orateur:** OOGURI, Hiroshi

**Classification de Session:** Costas Bachas day

ID de Contribution: 22

Type: **Non spécifié**

## **Novel Modular Forms Arising in Correlators in N=4 SYM**

*mercredi 26 juin 2024 10:45 (25 minutes)*

**Orateur:** GREEN, Michael

**Classification de Session:** Costas Bachas day

ID de Contribution: 23

Type: **Non spécifié**

## **Defects in fully extended TQFT – A tour in pictures**

*mercredi 26 juin 2024 11:10 (25 minutes)*

**Orateur:** BRUNNER, Ilka

**Classification de Session:** Costas Bachas day

ID de Contribution: 24

Type: **Non spécifié**

## Interpolating between QFT and machine learning

*mercredi 26 juin 2024 11:35 (25 minutes)*

Costas Bachas and I wrote several papers together on conformal field theory and Dirichlet branes. In this talk I will try to connect these topics with my more recent interests in machine learning.

**Orateur:** DOUGLAS, Michael

**Classification de Session:** Costas Bachas day

ID de Contribution: 25

Type: **Non spécifié**

## **BH and fuzzball perturbations from a gauge theory perspective**

*mercredi 26 juin 2024 12:00 (25 minutes)*

**Orateur:** BIANCHI, Massimo

**Classification de Session:** Costas Bachas day

ID de Contribution: 26

Type: **Non spécifié**

## Magnetic charges in gravity

*mercredi 26 juin 2024 14:00 (25 minutes)*

**Orateur:** HULL, Chris

**Classification de Session:** Costas Bachas day

ID de Contribution: 27

Type: **Non spécifié**

## **Back to D-Branes & Black Hole Information**

*mercredi 26 juin 2024 14:25 (25 minutes)*

**Orateur:** VERLINDE, Erik

**Classification de Session:** Costas Bachas day

ID de Contribution: **28**

Type: **Non spécifié**

## **From AdS\_3 to Carroll fever and flat mania**

*mercredi 26 juin 2024 14:50 (25 minutes)*

**Orateur:** PETROPOULOS, Marios

**Classification de Session:** Costas Bachas day

ID de Contribution: **29**

Type: **Non spécifié**

## **The omnipresence of the Arrow of Time**

*mercredi 26 juin 2024 15:45 (25 minutes)*

**Orateur:** PAPADOPOULOS, Vasilis

**Classification de Session:** Costas Bachas day

ID de Contribution: **30**

Type: **Non spécifié**

# Exponential S-matrix for Classical Observables

*mercredi 26 juin 2024 16:10 (25 minutes)*

**Orateur:** VANHOVE, Pierre (IPhT CEA-Saclay)

**Classification de Session:** Costas Bachas day

ID de Contribution: 31

Type: **Non spécifié**

## **Physics with Costas: exploring the String Landscape**

*mercredi 26 juin 2024 16:35 (25 minutes)*

**Orateur:** ANTONIADIS, Ignatios (Ecole Polytechnique Centre de Physique Theorique (CPHT))

**Classification de Session:** Costas Bachas day

ID de Contribution: 32

Type: **Non spécifié**

## **Supersymmetry Breaking Cascade Flow from N=2 to adjoint QCD**

*mercredi 26 juin 2024 17:00 (25 minutes)*

**Orateur:** D'HOKER, Eric

**Classification de Session:** Costas Bachas day

ID de Contribution: 33

Type: **Non spécifié**

## **No global symmetries and string universality**

*jeudi 20 juin 2024 11:00 (1 heure)*

**Orateur:** Prof. MONTERO, Miguel

**Classification de Session:** Formal theory