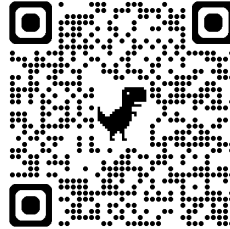


Corfu2025: Workshop on Quantum Gravity and Strings

SEPTEMBER 7 - SEPTEMBER 14, 2025

physics.ntua.gr/corfu2025/st.html

Scientific Programme



1 Program Summary

Monday, September 8, 2025

9:30	10:00	Samtleben, Henning	Holography for the IKKT matrix model
10:00	10:30	Trigiante, Mario	Warped Solutions in Type IIB Supergravity
10:30	11:00	Martucci, Luca	Gaillard-Zumino non-invertible symmetries
11:00	11:25	Coffee Break	
11:25	11:50	Van Muiden, Jesse	Quantum M2-branes and Holography
11:50	12:15	Van Hemelryck, Vincent	Supersymmetric scale separation orientifold vacua was meant IIB
12:15	12:40	Markou, Chrysoula	A new open string “tiling” and the closed string spectrum
12:40	13:00	Wang, Junkai	Quantum Gravity Meets DESI: Dynamical Dark Energy in Light of Swampland Trans-Planckian Censorship Conjecture
13:00	16:30	Lunch	
16:30	17:00	Ben-Dayana, Ido	The quantum focusing conjecture and the improved quantum null energy condition
17:00	17:30	Harmark, Troels	Gravitational solitons and non-relativistic string theory
17:30	17:55	Coffee Break	
17:55	18:20	Fontanella, Andrea	Galilean, Carrollian, and Flat-Space Holography from AdS/CFT
18:20	18:40	Zeko, Sara	Towards Nonrelativistic 4D Supergravity
18:40	19:00	Christodoulou, Stavros	Subleading Soft Dressings of Asymptotic States in Explicit QED Interactions
19:00	19:20	Moroni, Pietro	The supergravity dual of a finite duality cascade
20:30	23:00	Welcome Reception	

Tuesday, September 9, 2025

9:30	10:00	Cubrovic, Mihailo	Chaos, averaging and chaotic precision holography in LLM geometries
10:00	10:30	Porfyriadis, Achilleas	Symmetries near extreme black hole horizons
10:30	10:55	Basile, Ivano	String theory in the infrared
11:00	11:25	Coffee Break	
11:25	11:50	Zatti, Mateo	Insights on Black Holes Stability from Light Towers
11:50	12:15	Revello, Filippo	Axion-Scalar Dynamics and Non-Geodesic Distances
12:15	12:35	Raml, Thomas	Optimal Transport on Scalar Field Space
12:35	13:05	Kazakov, Vladimir	Matrix models for protected correlators of N=4 SYM and LLM geometry
13:05	16:30	Lunch	
16:30	17:00	Schachner, Andreas	Modular completions and RR sector couplings in Type II at higher derivatives
17:00	17:25	Tringas, George	Dualities and scale-separated AdS3 vacua
17:25	17:50	Coffee Break	
17:50	18:10	Masias, Joaquin	Dynamical dark energy in 0'B braneworlds
18:10	18:30	Fernandez Casas, Gonzalo	Transitions in minimally supersymmetric theories of quantum gravity
18:30	18:50	Staudt, Georgina	Scales in Moduli Space

Wednesday, September 10, 2025

9:30	10:00	Zwirner, Fabio	Supergravity breaking on Bieberbach manifolds
10:00	10:30	Bergshoeff, Eric	Non-relativistic Heterotic String Theory from a Target Space and Worldsheet Point of View
10:30	11:00	Hartong, Jelle	Boundary energy-momentum tensors for asymptotically flat spacetimes
11:00	11:25	Coffee Break	
11:25	11:50	Cribiori, Niccolo	Towards loop space quantum gravity
11:50	12:15	Herraez, Alvaro	The Double Expansion in Gravitational EFTs
12:15	12:35	Paraskevopoulou, Antonia Eirini	Emergence of F4-couplings in heterotic/type IIA dual string theories
12:35		Free Afternoon or Excursion	

Thursday, September 11, 2025

9:30	10:00	Ibañez, Luis	Some properties and uses of the Species Scale
10:00	10:30	Antoniadis, Ignatios	String landscape and extra dimensions
10:30	11:00	Weigand, Timo	Constraining Quantum Gravity - in theory and in the lab
11:00	11:25	Coffee Break	
11:25	11:55	Blumenhagen, Ralph	Emergence of CY triple intersection numbers
11:55	12:25	Haack, Michael	On the 1-loop graviton 4-point amplitude with reduced supersymmetry
12:25	12:50	Delgado, Matilda	TBA
13:00	16:30	Lunch	
16:30	17:00	Lüst, Severin	An index for flux vacua
17:00	17:30	Scalisi, Marco	TBA
17:30	17:55	Coffee Break	
17:55	18:20	Angius, Roberta	Non-invertible defects from the Conway SCFT to K3 sigma models
18:20	18:40	Bersigotti, Leonardo	The gravitino and the extra dimensions
19:30	0:30	Greek Night	

Friday, September 12, 2025

9:30	10:00	Leontaris, George	On Global Embeddings of Assisted Fibre Inflation
10:00	10:30	Yan, Ziqi	A BPS Road to Holography and Matrix Theory
10:30	11:00	Athenodorou, Andreas	The Worldsheet Axion: Insights from Lattice Simulations
11:00	11:25	Coffee Break	
11:25	11:50	Sterckx, Colin	New consistent truncations and applications
11:50	12:15	Toldo, Chiara	Quantum corrections to near-extremal black hole thermodynamics
12:15	12:35	Aparici, Miquel	Instabilities in scale-separated Casimir vacua
13:00	16:30	Lunch	
16:30	17:00	Cotrone, Aldo Lorenzo	Holographic Baryons as Quantum Hall Droplets
17:00	17:30	Macpherson, Niall	Embedding the Salam-Sezgin model in type II
17:30	17:55	Coffee Break	
17:55	18:20	Bansal, Sukruti	Loop blow-up inflation
18:20	18:40	Lehnert, Kay	Hitch-Hikers Guide to the Swampland: Cosmological Implications of the String-Theoretical Swampland Programme

Saturday, September 13, 2025

9:30	10:00	Lotito, Matteo	Proving the weak gravity conjecture in perturbative string theory
10:00	10:30	Tsuchiya, Asato	Emergence of (3+1)-dimensional expanding spacetime in the type IIB matrix model
10:30	11:00	Coffee Break	
11:00	11:30	Aschieri, Paolo	Noncommutative Riemannian Geometry
11:30	11:55	Aggarwal, Ankit	Near-extremal quantum field theories in two dimensions

2 Detailed Program with Abstracts

2.1 Monday, September 8, 2025

Time: 9:30 – 10:00

Speaker: Samtleben, Henning (Ecole Normale Supérieure Lyon)

Title: Holography for the IKKT matrix model

Abstract: A particularly interesting corner of the holographic dualities is the correspondence between the backgrounds of Dp-branes and their non-conformal field theory duals. Extrapolating this correspondence to the extremal case of $p=-1$, suggests a holographic duality for the IKKT matrix model. The dual D-instanton background is a half-supersymmetric BPS solution of Euclidean IIB supergravity. We construct a maximally supersymmetric one-dimensional supergravity theory around this background and match its fields to the lowest BPS multiplet of gauge invariant operators of the IKKT model.

Time: 10:00 – 10:30

Speaker: Trigiante, Mario (Politecnico di Torino)

Title: Warped Solutions in Type IIB Supergravity

Time: 10:30 – 11:00

Speaker: Martucci, Luca (Università di Padova and INFN Padova)

Title: Gaillard-Zumino non-invertible symmetries

Time: 11:25 – 11:50

Speaker: Van Muiden, Jesse (Imperial College London)

Title: Quantum M2-branes and Holography

Abstract: In this talk I will discuss a proposal uplifting the background field formalism for the worldsheet to M2-branes. The associated generating functional is then evaluated at long wavelengths in which case it decomposes into a sum over saddles comprising of degenerate and non-degenerate M2-branes. The non-degenerate branes are explicitly quantised in well known holographic backgrounds and I discuss how the resulting integrals over zero-mode sectors get localised according to space-time supersymmetry. Finally, I will discuss how observables associated to these quantum M2-branes require a subtle choice of ensemble in holography, when compared to the dual field theory.

Time: 11:50 – 12:15

Speaker: Van Hemelryck, Vincent (Uppsala University)

Title: Supersymmetric scale separation orientifold vacua was meant IIB

Abstract: central and ongoing question in string theory is whether flux compactifications can achieve scale separation, meaning that the cosmological constant is significantly smaller than the KK scale. In this talk, I will review existing models that feature scale separation, with a particular emphasis on compactifications involving non-vanishing internal curvature. Scale separation occurs in these scenarios when the internal scalar curvature decouples from the lowest non-trivial eigenvalue of the Laplacian, with two-step nilmanifolds serving as concrete examples. I will illustrate this with new 3d supersymmetric and scale-separated orientifold vacua of type IIB string theory, arising from compactifications on nilmanifolds with co-closed G2-structure.

Time: 12:15 – 12:40

Speaker: Markou, Chrysoula (Scuola Normale Superiore Pisa)

Title: A new open string “tiling” and the closed string spectrum

Time: 12:40 – 13:00

Speaker: Wang, Junkai (Tsinghua University)

Title: Quantum Gravity Meets DESI: Dynamical Dark Energy in Light of Swampland Trans-Planckian Censorship Conjecture

Abstract: As an implication from Quantum Gravity, the swamplandish Trans-Planckian Censorship Conjecture (TCC) prohibits eternal cosmological acceleration, a prediction that aligns naturally with the quintom-B behavior from the latest DESI DR2 data. Primarily, we implement TCC bounds within the framework of dynamical dark energy, especially in the w_0 waCDM parametrization and $f(T)$, $f(Q)$ modified gravities, demonstrating that TCC is very powerful to constrain or exclude them. Our findings imply that viable dynamical dark energy scenarios must asymptotically transit to deceleration,

shedding light on new physics consistent with both cosmological observations and fundamental Quantum Gravity principles.

Time: 16:30 – 17:00

Speaker: Ben-Dayan, Ido (Ariel University)

Title: The quantum focusing conjecture and the improved quantum null energy condition

Abstract: By rearranging its terms, the Quantum Focusing Conjecture (QFC) can be viewed as a quantum energy condition, and we can consider various limits. A recent restricted version is a limiting form where the quantum focusing vanishes $\Theta \rightarrow 0$, and has been proven for Braneworld scenario. As a result, we derive an improved quantum null energy condition (INEC) that can be proven with field theory techniques. We sketch the proof, and briefly discuss possible interpretations in the absence of one.

Time: 17:00 – 17:30

Speaker: Harmark, Troels (Niels Bohr Institute)

Title: Gravitational solitons and non-relativistic string theory

Abstract: We explore the non-relativistic string theory (NRST) limit of type II string theory and its action on gravitational solitons. As a start, we exhibit in detail that the NRST limit is T-dual to a discrete lightcone limit and can be viewed as a near-BPS limit. This also clarifies the nature of multi-string states of NRST and its connection to matrix string theory. We consider the NRST limit of the fundamental string soliton, confirming the recent finding that it corresponds to a relativistic near-horizon background, which we argue is the manifestation of a strong coupling phase of the NRST worldsheet theory. Furthermore, we consider the NRST limit of a class of D-branes as well as the NS5-brane. This reveals that they become gravitational solitons in NRST, as they are sourced torsional string Newton-Cartan (TSNC) geometries. Finally, for the NRST D-brane solitons we show that a further decoupling limit leads to new holographic correspondences between multicritical matrix theories and NRST in curved TSNC backgrounds.

Time: 17:55 – 18:20

Speaker: Fontanella, Andrea (Trinity College, Dublin)

Title: Galilean, Carrollian, and Flat-Space Holography from AdS/CFT

Abstract: I will discuss two recent developments in holography exploring singular spacetime limits of the AdS/CFT correspondence. The first part concerns a non-relativistic limit, where string theory on a String Newton–Cartan background of $\text{AdS}_5 \times S^5$ is holographically dual to Galilean Yang–Mills theory coupled to five adjoint scalar fields on the conformal boundary. I will explain how this limit can be consistently taken starting from Maldacena’s D3-brane construction, and how the symmetry analysis supports the proposed duality. The second part focuses on a Carroll limit of AdS/CFT, relating string theory in a curved Carroll bulk geometry to a magnetic Carroll $N=4$ super Yang–Mills theory on the boundary. I will describe the structure of Carroll symmetries, highlighting their non-linear realization and unusual closure properties. This framework also suggests a broader triality between Carroll strings, relativistic flat-space strings, and Carroll gauge theory, resolving the longstanding mismatch with the conformal boundary that arises in the standard flat-space limit of AdS/CFT.

Time: 18:20 – 18:40

Speaker: Zeko, Sara (Ruđer Bošković Institute)

Title: Towards Nonrelativistic 4D Supergravity

Abstract: In this talk, I will present work towards constructing four-dimensional nonrelativistic supergravity that can serve as an effective field theory for nonrelativistic string theory. I will start with a brief introduction to stringy Newton–Cartan geometry and the stringy nonrelativistic limit of ten-dimensional NS gravity. I will, then, explain how this limit can be extended to four-dimensional supergravity that includes an axion field. Finally, I will comment on the steps needed to turn this construction into a fully-fledged nonrelativistic supergravity theory and on how similar steps can be useful for taking Carrollian limits of ten-dimensional NS gravity.

Time: 18:40 – 19:00

Speaker: Christodoulou, Stavros (University of Cyprus)

Title: Subleading Soft Dressings of Asymptotic States in Explicit QED Interactions

Abstract: We adopt the arguments given by Choi and Akhoury to construct Faddeev–Kulish states to subleading order in the soft momentum expansion and to first order in the QED coupling constant for three distinct scattering processes: the electron-muon, electron-positron, and electron-photon interactions. We further ensure that the equivalence between the dressed virtual amplitude and the infrared-finite part of the corresponding Dyson’s amplitude remains valid even when the dressings extend to subleading order for all three interactions. In addition, we demonstrate that soft radiation cannot be added to the tree-level dressed amplitude. This suppression of soft radiation by the dressings, during the interactions under consideration, enables us to argue that, in the dressed state formalism, the soft and hard sectors of these scattering

processes are not independent. The absence of real soft radiation from the asymptotic Hilbert space implies that the dressed state formalism yields the same cross sections as the Bloch-Nordsieck method.

Time: 19:00 – 19:20

Speaker: Moroni, Pietro (SISSA)

Title: The supergravity dual of a finite duality cascade

Abstract: Cascading RG flows are characteristic of $N=1$ gauge theories realized by D3-branes probing singularities in the presence of fractional branes. I will discuss a setup related to that of the Klebanov-Strassler model, where the addition of an orientifold plane modifies the cascade structure: the RG flow now consists of a finite number of steps, originating from a UV fixed point with a finite number of degrees of freedom, but still ending up with confinement in the IR. I will describe a supergravity solution that we propose should be dual to this flow, that reproduces all its salient features.

2.2 Tuesday, September 9, 2025

Time: 9:30 – 10:00

Speaker: Cubrovic, Mihailo (Institute of Physics, Belgrade)

Title: Chaos, averaging and chaotic precision holography in LLM geometries

Abstract: We consider dynamics of ensembles of geodesics in Lin-Lunin-Maldacena (LLM) geometries, first black and white and then grayscale (coarse-grained). We find that ensemble averaging over geodesics converges to an "average" geodesic which on long timescales coincides with the geodesic in grayscale geometries. The same conclusion holds accordingly also for the two-point functions of the dual CFT in the eikonal regime. We then construct a black hole geometry by encircling the singularity of the grayscale LLM solution with a thermal horizon and find that the geodesics and two-point functions in this background are obtained in the first approximation simply by compactifying the ensemble-averaged results on the thermal circle. All of this suggests that we might understand black holes as averages over microstate solutions.

Time: 10:00 – 10:30

Speaker: Porfyriadis, Achilleas (CCTP, U. Crete)

Title: Symmetries near extreme black hole horizons

Abstract: Near the horizon of extremal black holes the linear Einstein equations acquire an accidental symmetry. This symmetry is a linearized diffeomorphism which acts on the perturbative solutions around the background near-horizon spacetime and maps them amongst themselves. It is accidental in the sense that it enlarges the set of such transformations to make it strictly larger than the background's isometries. Accidental symmetries combine neatly with the near-horizon $SL(2)$ isometries inside a Virasoro algebra and can be thought of as on-shell large diffeomorphisms/asymptotic symmetries of AdS_2 .

Time: 10:30 – 10:55

Speaker: Basile, Ivano (Arnold-Sommerfeld Center for Theoretical Physics LMU Munich and Max-Planck-Institut für Physik, Garching)

Title: String theory in the infrared

Abstract: While string theory has distinct high-energy signatures, its low-energy manifestations can be manifold. Yet, they seem to share common features which hold deep conceptual lessons and may lead to technologically accessible experiments. I will discuss how general considerations on quantum gravity can guide the search for these common features, and how they arise in the worldsheet formalism.

Time: 11:25 – 11:50

Speaker: Zatti, Mateo (MPP, München)

Title: Insights on Black Holes Stability from Light Towers

Abstract: We revisit and study quantum corrections to the supersymmetric entropy of BPS black holes in 4d $N=2$ supergravity, which can be obtained from Type IIA string theory compactified on a Calabi-Yau threefold. Macroscopically, these corrections arise from an infinite series of higher-derivative F-terms that encode modifications to the two-derivative supergravity effective action. They result from integrating out the tower of light D0-branes in the large volume patch. We analyze the most general black hole configuration with D0–D2–D4–D6 charges and find that this setup can receive non-perturbative corrections. We interpret these corrections as arising from virtual particle pair production. We characterize the quantum effects by providing both a semi-classical description and a precise one-loop evaluation. We show that, despite the presence of non-trivial corrections, the stability of the system remains intact. As a byproduct, we uncover a

correspondence among virtual pair production of the states in the lightest UV tower, classical confinement in the black hole throat and non-perturbative corrections to the Wald entropy.

Time: 11:50 – 12:15

Speaker: Revello, Filippo (KU Leuven)

Title: Axion-Scalar Dynamics and Non-Geodesic Distances

Abstract: We study the cosmology of axion-scalar pairs, coupled by a hyperbolic field space metric and with an arbitrary polynomial scalar potential. Borrowing tools from the theory of dynamical systems, we are able to classify all late-time trajectories and extract physical properties of the asymptotic solutions. In a string theoretic setting, this can be applied to one-modulus asymptotic limits of type II compactifications, including the effect of the flux scalar potential for both axions and saxions. Our results allow us to test modifications of the Swampland Distance Conjecture (SDC) to a dynamical setting, suggesting that towers of states should become exponentially light in the distance measured along the trajectory.

Time: 12:15 – 12:35

Speaker: Raml, Thomas (Max Planck Institute for Physics Munich)

Title: Optimal Transport on Scalar Field Space

Abstract: Optimal Transport on Scalar Field Space (Quantum Gravity): (work in progress) The Swampland Distance Conjecture predicts an infinite tower of massless states when approaching infinite-distance points in moduli space. In phenomenologically viable scenarios, the flat directions are lifted by a scalar potential and hence this requires an extension of the Swampland conjectures to scalar field spaces with non-trivial potentials, rather than just moduli spaces. In this talk, I discuss a new way to define distances on scalar field space using the theory of Optimal Transport. Starting from the so called Wasserstein distance on the space of probability measures, I will explain how to translate the problem of distances on field space to this setting using the WKB approximation and associated Hamilton-Jacobi problem. Subsequently I discuss several generalisations that allow for a notion of distance or "cost function" in the presence of a potential. I will conclude with some simple examples, including the framework of fake supergravity in the context of black holes.

Time: 12:35 – 13:05

Speaker: Kazakov, Vladimir (Ecole Normale Supérieure)

Title: Matrix models for protected correlators of $N=4$ SYM and LLM geometry

Time: 16:30 – 17:00

Speaker: Schachner, Andreas (LMU Munich)

Title: Modular completions and RR sector couplings in Type II at higher derivatives

Time: 17:00 – 17:25

Speaker: Tringas, George (Lehigh University)

Title: Dualities and scale-separated AdS3 vacua

Time: 17:50 – 18:10

Speaker: Masias, Joaquin (Max Planck Institute for Physics)

Title: Dynamical dark energy in 0'B braneworlds

Abstract: We present a novel realization of dark bubble cosmology in non-supersymmetric string theory. Among the simplest models in ten dimensions, the type 0'B orientifold is the unique option which yields a scale-separated construction. The resulting setting produces a logarithmically varying dynamical dark energy, reflecting its holographic counterpart in terms of running gauge couplings. We analyze in detail the phenomenological consequences of the model for particle physics, inflation and late-time cosmology. We find that, although particle physics may be consistently realized, neither early-time nor late-time cosmology are observationally viable.

Time: 18:10 – 18:30

Speaker: Fernandez Casas, Gonzalo (IFT-MADRID)

Title: Transitions in minimally supersymmetric theories of quantum gravity

Time: 18:30 – 18:50

Speaker: Staudt, Georgina (Max Planck Institute for Physics)

Title: Scales in Moduli Space

Abstract: The species scale has emerged as a critical concept in the study of Effective Field Theory limits in quantum gravity, particularly in the Swampland program. As a proposed UV cutoff, it marks the energy scale beyond which a given EFT may break down and its description becomes unreliable. Concretely, we discuss moduli-dependent definitions of the species scale in quantum gravity based on a lower bound on the entropy of extremal black holes with higher curvature corrections, leading to an argument for the conjecture that the partition function of a black hole can be related to the topological string partition function. Furthermore, we investigate a recently discovered pattern in the string landscape, which relates the (gradients of the) mass gap of light towers and the species scale, extending the analysis to subleading order in some calculable infinite-distance limits of supersymmetric compactifications. Moreover, we study an analogous relation between the species scale and a recently proposed black-hole scale. We conclude with a summarizing discussion of the results including an outline of further directions towards which current research is being done.

2.3 Wednesday, September 10, 2025

Time: 9:30 – 10:00**Speaker:** Zwirner, Fabio (Università di Padova and INFN Padova)**Title:** Supergravity breaking on Bieberbach manifolds

Time: 10:00 – 10:30**Speaker:** Bergshoeff, Eric (Rijksuniversiteit Groningen)**Title:** Non-relativistic Heterotic String Theory from a Target Space and Worldsheet Point of View

Time: 10:30 – 11:00**Speaker:** Hartong, Jelle (University of Edinburgh)**Title:** Boundary energy-momentum tensors for asymptotically flat spacetimes

Abstract: Future null infinity of an asymptotically flat spacetime is a Carrollian manifold. I will consider asymptotic solutions to the 4D vacuum Einstein equations where future null infinity is endowed with the most general Carroll metric that is allowed by the Einstein equations. I will show that the first few orders of the near-boundary expansion are organised in terms of connections that take values in the conformal Carroll algebra subject to a set of curvature constraints. The remaining nonzero curvatures are equal to half of the leading order (in the sense of a near-boundary expansion) Weyl tensor components and these dictate the extent to which the spacetime is radiative or non-radiative. These curvatures lead to a boundary Carroll covariant notion of the vacuum soft shear and news tensors which are characterised in terms of two boundary scalar fields. These scalars can be thought of as Goldstone fields for BMS transformations that parameterise the vacuum degeneracy. In the second half of the talk I will discuss counterterms that need to be added to the Einstein-Hilbert action and show that the on shell variation of the renormalised action can be written in terms of responses to variations of the Carroll metric data and the shear. This leads to an energy-momentum-news complex whose diffeomorphism Ward identity agrees with the Bondi loss equations for the mass and angular momentum aspects. It furthermore satisfies a trace relation due to Weyl invariance but we will see that the Carroll boosts are anomalous and that the anomaly is equal to one of the curvatures of the conformal Carroll algebra. Finally, I will show that the Bondi loss equations can be rewritten in terms of a much simpler boundary Carroll energy-momentum tensor but which is not conserved and whose non-conservation is entirely dictated by the non-vanishing curvatures of the conformal Carroll algebra.

Time: 11:25 – 11:50**Speaker:** Cribiori, Niccolo (Max-Planck-Institut für Physik, Garching)**Title:** Towards loop space quantum gravity

Time: 11:50 – 12:15**Speaker:** Herraez, Alvaro (Max-Planck-Institut für Physik, Garching)**Title:** The Double Expansion in Gravitational EFTs

Time: 12:15 – 12:35**Speaker:** Paraskevopoulou, Antonia Eirini (LMU/MPI Munich)**Title:** Emergence of F4-couplings in heterotic/type IIA dual string theories

2.4 Thursday, September 11, 2025

Time: 9:30 – 10:00

Speaker: Ibañez, Luis (Universidad Autónoma de Madrid)

Title: Some properties and uses of the Species Scale

Time: 10:00 – 10:30

Speaker: Antoniadis, Ignatios (Chulalongkorn University, Bangkok and LPTHE Sorbonne Université, Paris)

Title: String landscape and extra dimensions

Time: 10:30 – 11:00

Speaker: Weigand, Timo (University of Hamburg)

Title: Constraining Quantum Gravity - in theory and in the lab

Abstract: We discuss two examples of how to find and test constraints on quantum gravity. First, in the laboratory of complex geometry, we confirm the prediction of the Emergent String Conjecture for the asymptotic behaviour of quantum gravity theories for Type IIB compactifications on Calabi-Yau threefolds near infinite distance degenerations of complex structure. A detailed understanding of the geometry of such limits as stable degenerations allows us to establish the existence of towers of particles behaving as Kaluza-Klein or perturbative string excitations, and to make new predictions for the BPS counting of certain special Lagrangian three-cycles. In the second part of the talk, we explain why finding an axion-like particle with a charge-to-mass ratio much larger than that of the QCD axion would rule the perturbative heterotic string. Special emphasis is put on models with a non-standard embedding of hypercharge into both E_8 factors, hence closing an important loophole to this general result previously formulated by Agrawal, Nee and Reig. For example, an axion as required for cosmic birefringence would rule out perturbative heterotic string theory.

Time: 11:25 – 11:55

Speaker: Blumenhagen, Ralph (Max-Planck-Institut für Physik, Garching and Exzellenzcluster ORIGINS, Garching)

Title: Emergence of CY triple intersection numbers

Time: 11:55 – 12:25

Speaker: Haack, Michael (Arnold-Sommerfeld Center for Theoretical Physics LMU Munich)

Title: On the 1-loop graviton 4-point amplitude with reduced supersymmetry

Time: 12:25 – 12:50

Speaker: Delgado, Matilda (University of Ioannina)

Title: TBA

Time: 16:30 – 17:00

Speaker: Lüst, Severin (Universite de Montpellier)

Title: An index for flux vacua

Time: 17:00 – 17:30

Speaker: Scalisi, Marco (University of Catania)

Title: TBA

Time: 17:55 – 18:20

Speaker: Angius, Roberta (Instituto de Física Teórica UAM-CSIC, Madrid)

Title: Non-invertible defects from the Conway SCFT to $K3$ sigma models

Abstract: Recently, symmetries have been reinterpreted in terms of topological operators supported on codimension-1 submanifolds of spacetime and satisfying group-like and invertible fusion rules. This has naturally led to the notion of generalized symmetries as categories of topological defects supported on arbitrary codimension submanifolds with

possibly non-invertible fusion rules. In this talk, I will present first results toward the classification of topological defects that commute with the spectral flow and the $\mathcal{N}=(4, 4)$ superconformal symmetry in two dimensional non-linear sigma models on K3, as well as those that preserve supersymmetry in the Conway superconformal field theory $\mathcal{V}^f_{\text{natural}}$. By analyzing the induced action of these defects on the lattice of RR D-brane charges in the K3 models, and on a particular embedding of the Leech lattice into the space of Ramond ground states in the Conway theory, I will extract a number of parallel structural results for the respective categories of topological defects. These findings lead me to conjecture a correspondence between four-plane-preserving topological defect lines (TDLs) in $\mathcal{V}^f_{\text{natural}}$ and supersymmetry-preserving TDLs in K3 non-linear sigma models. This correspondence extends the known relation between the symmetry groups of the two theories to a deeper equivalence at the level of their tensor categorical symmetries.

Time: 18:20 – 18:40

Speaker: Bersigotti, Leonardo (Max Planck Institute for Physics)

Title: The gravitino and the extra dimensions

Abstract: We investigate the relation between the existence of extra dimensions and the scale at which supersymmetry is expected to break down, linking it to the threshold at which the Effective Field Theory description becomes invalid. We use the Gravitino Conjecture (GC) to make predictions on the number and the size of extra dimensions based on the value of the gravitino mass, ensuring our results align with most recent constraints on extra dimensions. For doing so, we generalize the GC by introducing a dependence on the number of mesoscopic extra dimensions considered in the theory, using insights from string compactification. We draw scenarios connecting the values of the gravitino mass and of the scale of supersymmetry break down to the phenomenology of the extra dimensions. In detail, we explore the experimentally viable case where the size of the extra dimensions is comparable to the distance at which deviations from Newtonian gravity have not yet been detected. Finally, we draw scenarios also where the mass of the gravitino is enough high for allowing to gravity mediation for the breaking of supersymmetry.

2.5 Friday, September 12, 2025

Time: 9:30 – 10:00

Speaker: Leontaris, George (University of Ioannina)

Title: On Global Embeddings of Assisted Fibre Inflation

Abstract: TBA

Time: 10:00 – 10:30

Speaker: Yan, Ziqi (Nordita and NBI)

Title: A BPS Road to Holography and Matrix Theory

Abstract: I will discuss recent progress on a framework that unifies BPS decoupling limits in string theory and M-theory, which gives a new perspective on AdS/CFT and matrix theories. This perspective naturally involves non-Lorentzian geometries. I will show how this framework implies generalizations of AdS/CFT, as well as a correspondence between finite-N matrix theory and non-Lorentzian supergravity.

Time: 10:30 – 11:00

Speaker: Athenodorou, Andreas (The Cyprus Institute)

Title: The Worldsheet Axion: Insights from Lattice Simulations

Abstract: I will present recent results obtained from lattice simulations of $SU(N)$ gauge theories in $D=4+1$, highlighting how the axion emerges from these data. The discussion will cover results for the closed flux tube (the so-called *emph*torolon), the open flux tube, as well as closed strings with N -ality $k=2$. By applying the Thermodynamic Bethe Ansatz (TBA) to compute the finite-volume spectrum of closed fundamental flux tubes, we confirm that the observed states are accurately described by the low-energy effective theory of a long string. This theory consists of two translational Goldstone bosons (*emph*phonons) together with a massive pseudoscalar—the *emph*worldsheet axion—which couples to the phonons through a θ -term. Furthermore, we find that the leading axion–axion and axion–phonon interactions are well approximated by the $T\bar{T}$ deformation of a free axion theory.

Time: 11:25 – 11:50

Speaker: Sterckx, Colin (INFN Padova)

Title: New consistent truncations and applications

Abstract: We report on recent advances in the study of consistent truncations and their applications. After a brief overview of established techniques, based on exceptional field theory and generalised G-structures, we will highlight the current

gap between existence proofs and explicit constructions available in the literature. We then introduce two new methods for constructing consistent truncations explicitly. As an application, we will present the uplift of half-maximal AdS₄ supersymmetric solutions to ten and eleven dimensions, hereby extending to type IIB a series of results previously known in the context of M-theory and ABJM holography.

Time: 11:50 – 12:15

Speaker: Toldo, Chiara (ULB Brussels)

Title: Quantum corrections to near-extremal black hole thermodynamics

Abstract: From the perspective of classical gravity, a black hole is the simplest object we know of. At the same time, it possesses huge entropy, hinting at an incredibly complex microstructure: understanding this fact falls in the realm of quantum gravity. In this talk I will review recent results concerning the microscopics and the thermodynamics of black holes in asymptotically flat and (Anti-)de Sitter space. In the first part, I will describe how recently developed techniques allow to compute the quantum corrections to the entropy of near-extremal Kerr black holes. I will show that the quantum-corrected near-extremal entropy exhibits $3/2 \log T$ behavior characteristic of the Schwarzian model, and predicts the lifting of the ground state degeneracy for the extremal Kerr black hole. I will then show the computation for the density of states for spinning black holes in AdS₄, which admit a supersymmetric limit, and comment on the spectrum of near-BPS states and on the interpretation in terms of the dual 3d field theory. I will finish with some work in progress on quantum corrections to the entropy of near extremal de Sitter black holes.

Time: 12:15 – 12:35

Speaker: Aparici, Miquel (MPP Munich)

Title: Instabilities in scale-separated Casimir vacua

Abstract: Parametric scale separation is notoriously difficult to achieve in flux compactifications of gravitational effective theories. An appealing alternative to conventional Freund-Rubin vacua involves Ricci-flat internal manifolds, where the energy supplied by fluxes is balanced not by curvature but by the Casimir energy. The internal volume can be stabilized by this mechanism producing anti-de Sitter geometries with parametric scale separation, including an explicit example in eleven-dimensional supergravity. We study deformations of these geometries, showing the presence of perturbative and non-perturbative instabilities.

Time: 16:30 – 17:00

Speaker: Cotrone, Aldo Lorenzo (University of Florence)

Title: Holographic Baryons as Quantum Hall Droplets

Abstract: In QCD-like theories with one flavor, baryons at low energy can be argued to be pancake-shaped objects hosting a Chern-Simons theory on their world-volume - they are analogous to quantum Hall droplets. This statement can be made precise in a very well-known holographic QCD theory, where the baryons can be explicitly constructed and their main physical properties, such as size and mass, can be calculated from first principles.

Time: 17:00 – 17:30

Speaker: Macpherson, Niall (University of Oviedo)

Title: Embedding the Salam-Sezgin model in type II

Abstract: TBA

Time: 17:55 – 18:20

Speaker: Bansal, Sukruti (Technical University of Vienna)

Title: Loop blow-up inflation

Abstract: Slow-roll is naturally realized thanks to the fact that the blow-up mode is a leading-order flat direction lifted by string loops which are unavoidable and generate a plateau at large field values. We check that throughout the whole inflationary dynamics the effective field theory is under control. We perform a phenomenological analysis determining the exact number of efoldings by studying the post-inflationary evolution. We determine the values of the microscopic parameters which lead to agreement with CMB data, together with the prediction of a tensor-to-scalar ratio of order $r_{\text{sim}} 10^{-5}$.

Time: 18:20 – 18:40

Speaker: Lehnert, Kay (National University of Ireland, Maynooth)

Title: Hitch-Hikers Guide to the Swampland: Cosmological Implications of the String-Theoretical Swampland Programme

Abstract: String theory is a powerful mathematical toolbox that allows us to build a plethora of different effective field theories. But not everything is possible: the string-theoretical swampland programme collects rules that separate the

landscape of feasible theories from the swampland of theories that fail in the high-energy regime. I present the dividing rules and focus on their implications for cosmology, from the requirement that black holes decay to the finding that Einstein's biggest blunder was actually a blunder and Λ is no more.

2.6 Saturday, September 13, 2025

Time: 9:30 – 10:00

Speaker: Lotito, Matteo (ITF Madrid)

Title: Proving the weak gravity conjecture in perturbative string theory

Abstract: TBA

Time: 10:00 – 10:30

Speaker: Tsuchiya, Asato (Shizuoka University)

Title: Emergence of (3+1)-dimensional expanding spacetime in the type IIB matrix model

Abstract: The type IIB matrix model is a promising candidate for a nonperturbative formulation of superstring theory. Recently we performed complex Langevin simulations of the Lorentzian version of the model. In this talk, we show some numerical results that suggest the emergence of a smooth (3+1)-dimensional expanding spacetime.

Time: 11:00 – 11:30

Speaker: Aschieri, Paolo (Università Piemonte Orientale)

Title: Noncommutative Riemannian Geometry

Abstract: We review different approaches to Levi-Civita connections on noncommutative spaces. Considering the metric as a dynamical field, no compatibility between the metric and the noncommutative structure is a priori required. For noncommutative spaces that are triangular quantum groups or their associated quantum (homogeneous) algebras existence and uniqueness of the Levi-Civita connection for arbitrary metrics is shown via a Koszul formula. Explicit examples -in particular the one associated with Sweedler Hopf algebra- are presented. A key ingredient is the Cartan calculus with noncommutative covariant derivatives (connections). This leads to the Cartan structure equations and the Bianchi identities. Einstein equations on these noncommutative spaces are presented.

Time: 11:30 – 11:55

Speaker: Aggarwal, Ankit (Vienna University of Technology)

Title: Near-extremal quantum field theories in two dimensions

Abstract: Near-extremal black holes exhibit universal features such as the near-extremal behaviour of entropy and black hole energy as a function of temperature. These are captured by Jackiw-Teitelboim (JT) gravity in the bulk. One could ask: is it possible to see this universality emerging purely from the dual QFT side? We answer this question in the affirmative through three examples of two-dimensional QFTs: 2d CFTs, Warped CFTs, and Carrollian CFTs. We describe the regimes of these theories in which the aforementioned universal behaviour is observed. We compare and contrast it to the universal Cardy regime of these theories.
