MEXTRINGS 2014

Luis Aparicio
MSSM & NMSSM in ligth of modulus dominated SUSY-breaking in F-theory

The recent experimental results are consistent with a SUSY scenario with certain amount of fine-tuning. In this context, we describe and compare the phenomenological viability of MSSM and NMSSM schemes with soft term parameters subject to unified boundary conditions from F-theory GUT. We find that very simple assumptions about modulus dominance SUSY breaking in F-theory unification lead to a predictive set of boundary conditions for both MSSM and NMSSM, consistent with all phenomenological constraints. We will discuss the similarities and differences that we obtain in the phenomenology of this two scenarios.

Bartomeu Fiol
Probing Conformal Field Theories

Abstract
We consider a heavy probe coupled to a general four-dimensional conformal field theory, and argue that a variety of interesting quantities are determined in terms of a single function, the Bremsstrahlung function, that depends on the probe and on the theory. For the particular case of a heavy quark coupled to N=4 super Yang Mills, we use localization techniques to determine the corresponding Bremsstrahlung function exactly. We present various applications, from computations of exact transport coefficents to novel prediction for string perturbation theory.

Monica Guica
Gravitation from entanglement in holographic CFTs

Abstract
Entanglement entropy obeys a 'first law', an exact quantum generalization of the ordinary first law of thermodynamics. In any CFT with a semiclassical holographic dual, this first law has an interpretation in the dual gravitational theory as a constraint on the spacetimes dual to CFT states. For small perturbations around the CFT vacuum state, we show that the set of such constraints for all ball-shaped spatial regions in the CFT is exactly equivalent to the requirement that the dual geometry satisfy the gravitational equations of motion, linearized about pure AdS. For theories with entanglement entropy computed by the Ryu-Takayanagi formula S=A/(4G_N), we obtain the linearized Einstein equations. For theories in which the vacuum entanglement entropy for a ball is computed by more general Wald functionals, we obtain the linearized equations for the associated higher-curvature theories. Using the first law, we also derive the holographic dictionary for the stress tensor, given the holographic formula for entanglement entropy. This method provides a simple alternative to holographic renormalization for computing the stress tensor expectation value in arbitrary higher derivative gravitational theories.

Albion Lawrence
Coarse Graining and Entanglement in Quantum Dynamics

Abstract
We consider the long-wavelength degrees of freedom of an interacting quantum field theory as an open quantum system, and derive the equations of motion for the reduced density matrix in this case using both Hamiltonian and path integral methods. We will pay particular attention to the effects of finite time resolution. We will open with a review of other formalisms for coarse graining and renormalization, including recent work on holographic Wilsonian renormalization by Balasubramanian, Guica, and Lawrence, highlighting the different questions each formalism is designed to answer. This talk is based on work in progress with Cesar Agon, Vijay Balasubramanian, and Skyler Kasko.

Oleg Lebedev
Higgs Portal

The Higgs sector of the Standard Model is special for various reasons. It can hold the key to the flavor problem and the origin of fermion masses. It may also be our only link to the hidden sector, which may host dark matter, an inflaton, etc. I will discuss implications of these ideas for particle and dark matter experiments.

Leo Pando Zayas
Toward a Higher-Spin Dual of Interacting Field Theories

Abstract
We show explicitly how the exact renormalization group equation of interacting vector models in the large N limit can be mapped into certain higher-spin equations of motion. The equations of motion are generalized to incorporate a multiparticle extension of the higher-spin algebra, which reflects the "multitrace" nature of the interactions in the dual field theory from the holographic point of view.

Gianmassimo Tasinato
Dark energy and the photon

Abstract
We discuss a consistent theory for a self-interacting vector field, breaking an Abelian symmetry in such a way to obtain an interesting behavior for its longitudinal polarization. In an appropriate decoupling limit, the dynamics of the longitudinal mode is controlled by Galileon interactions. The full theory away from the decoupling limit does not propagate ghost modes, and can be investigated in regimes where non-linearities become important. When coupled to gravity, this theory provides a candidate for dark energy, since it admits de Sitter cosmological solutions characterized by a technically natural value for the Hubble parameter.

Erik Tonni
Aspects of entanglement:
entropies, negativity and causal holographic information

Entanglement of quantum states and its measures play an important role in many areas of theoretical physics. The entanglement entropy is a good measure for pure states, while the negativity allows to measure entanglement for mixed states. A method to compute negativity in QFT through the replica trick will be described. Analytic results and their numerical checks will be presented for simple 2D CFTs like the compactified boson and the Ising model. Within the class of theories with a holographic dual, besides the holographic entanglement entropy, a natural quantity to introduce is the causal holographic information. Its definition and its temporal evolution in the Vaidya backgrounds, modeling the formation of a black hole, is discussed.

Diego Trancanelli
't Hooft meets Wilson: supersymmetric loops in N=4 SYM

Supersymmetric Wilson and 't Hooft operators are interesting observables for a series of reasons: they allow for exact results (via localization to matrix models) and for non-trivial, dynamical tests of S-duality. They also give rise, in the context of the AdS/CFT correspondence, to a rich dictionary with dual objects in the bulk (strings, branes, and "bubbling" geometries). In this talk I will review some results about the construction and computation of these operators and sketch some new ideas on how to combine them into supersymmetric webs.

Ivonne Zavala
TBA