

## University of Crete HEP Seminars 2009/2010

Fri Jan 22, 2010

### 2pm - 3pm Yaron Oz (Tel Aviv U.) on "Gravity and the Shape of Turbulence"

**Where:** Physics Department, Seminar Room 2nd Floor

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: The dynamics of fluids is a long standing challenge that remained as an unsolved problem for centuries. Understanding its main features, chaos and turbulence, is likely to provide an understanding of the principles and non-linear dynamics of a large class of systems far from equilibrium. We consider a conceptually new viewpoint to study these features using black hole dynamics. Since the gravitational field is characterized by a curved geometry, the gravity variables provide a geometrical framework for studying the dynamics of fluids: A geometrization of turbulence.

Fri Feb 12, 2010

### 3pm - 4pm Ioannis Iatrakis (Crete) on "An AdS/QCD model from Sen's tachyon action"

**Where:** Physics Department 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: The dynamics of fundamental degrees of freedom of QCD are studied using a six-dimensional holographic model. This involves coincident brane-antibrane pairs, in a  $AdS_6$  background, which are described by Sen's action. An open string tachyon is present in the model, and its condensation corresponds to the chiral symmetry breaking of QCD. The value of the condensate is determined dynamically for both zero and nonzero temperature. The spectrum of the low-lying mesons and some decay constants are calculated.

Tue Feb 16, 2010

### 5pm - 6pm

#### Tasios Petkou (Crete) on "Gauge Fields, Membranes and Subdeterminant Vector Models"

**Where:** Physics Department 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:** ABSTRACT: An informal seminar on the recent paper 1002.2437.

Fri Feb 19, 2010

### 3pm - 4pm

#### Gerasimos Rigopoulos (Helsinki) on "Path integral formulation for inflationary perturbations"

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: The quantum theory of cosmological perturbations in single field inflation is formulated in terms of a path integral from first principles. At the linear level, well known results from gauge invariant perturbation theory are recovered. At the level of interactions, it is shown that apart from the propagating physical degrees of freedom, it is useful to include various commuting and anti-commuting auxiliary fields which do not appear in the initial and final states, but lead to additional internal lines in Feynman diagrams. To illustrate the formalism, the 3-point and 4-point functions of inflationary perturbations are computed at tree-level and future applications are discussed.

## University of Crete HEP Seminars 2009/2010

Tue Feb 23, 2010

3pm - 4pm

### Mariano Quiros (Barcelona) on "SOFT-WALL STABILIZATION AND ELECTROWEAK BREAKING"

**Where:** Physics Department, Seminar Room 2nd Floor

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: I will analyze a general class of 5D soft-wall models with AdS metric near the UV brane and 4D Poincare invariance where the IR scale is determined dynamically. A large UV/IR hierarchy can be generated without any fine-tuning, thus solving the electroweak/Planck scale hierarchy problem. I will discuss EW breaking triggered by a bulk Higgs field.

Tue Mar 9, 2010

3pm - 4pm Emmanuel Saridakis (Athens) on "Aspects of Horava-Lifshitz Cosmology"

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: We investigate cosmological scenarios in a universe governed by Horava-Lifshitz gravity, with or without the detailed-balance condition. In particular, we study the dark energy dynamics, the bouncing solutions and the cyclic behavior, and we perform a phase-space analysis examining the late-time cosmological evolution. Furthermore, we use observational data in order to constrain the parameters of the theory, and additionally we discuss some thermodynamic aspects of Horava-Lifshitz cosmology. Although this analysis indicates that Horava-Lifshitz cosmology can be very interesting, Horava-Lifshitz gravity itself may have crucial conceptual and theoretical problems, as a simple perturbation analysis indicates.

Fri Mar 19, 2010

3pm - 4pm Herman Nicolai (AEI Golm) on "E10 - an Appetizer"

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:** ABSTRACT: A special bonus seminar giving an introduction to E<sub>10</sub>.

Tue Mar 23, 2010

3pm - 4pm Hermann Nicolai (AEI Golm) on "Octonions and quantum gravity"

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

Abstract: The mini-superspace quantization of D=11 Supergravity is equivalent to the quantization of a  $E_{10}/K(E_{10})$  coset space sigma model, when the latter is restricted to the  $E_{10}$  Cartan subalgebra. As a consequence, the wavefunctions solving the relevant mini-superspace Wheeler-DeWitt equation involve automorphic (Maass wave) forms under the modular group  $W^{+(E_{10})} \cong \text{PSL}_2(\mathbb{O})$ . Using Dirichlet boundary conditions on the billiard domain a general inequality for the Laplace eigenvalues of these automorphic forms is derived, entailing a wave function of the universe that is generically complex and always tends to zero when approaching the initial singularity. The significance of these properties for the nature of singularities in quantum cosmology in comparison with other approaches is discussed. The present approach also offers interesting new perspectives on some long standing issues in canonical quantum gravity.

Wed Mar 24, 2010

3pm - 4pm Marco Panero (ETH Zürich) on "3 = Infinity"

**Where:** Physics Department 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:** ABSTRACT: TBA

## University of Crete HEP Seminars 2009/2010

Fri Mar 26, 2010

### 3pm - 4pm Xi Yin (Harvard U.) on "Higher spin gauge theory and holography"

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

Abstract: We study Vasiliev's minimal higher spin gauge theory in AdS<sub>4</sub> and compute the tree level three-point function coefficients of the dual higher spin currents. In particular, we will find precise agreement with that of the free and critical O(N) vector model in three dimensions, at leading nontrivial order in the 1/N expansion, thus confirming a conjecture of Klebanov and Polyakov.

Tue Apr 27, 2010

### 3pm - 4pm

#### Vasilis Niarchos (Ecole Polytechnique, CPTH) on Fluid Dynamics on a Brane: a worldvolume effective theory for black holes

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: I will discuss a recently proposed worldvolume effective theory for higher-dimensional black holes. The theory, which regards a black hole as a black brane curved into a submanifold of spacetime can be formulated in terms of an effective fluid that lives on a dynamical worldvolume. I will describe the qualitatively new black hole solutions that can be obtained with this theory. These include helical black rings, black odd-spheres, non-uniform black cylinders, etc. An interesting relation to the fluid-gravity correspondence will also be discussed.

Fri Apr 30, 2010

### 3pm - 4pm

#### Volodya Kazakov (Ecole Normale Supérieure) on "Integrability of AdS/CFT correspondence and exact spectrum of N=4 SYM theory"

**Where:** Physics Department 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: I will review the recent proposal concerning exact calculation of the spectrum of conformal dimensions of planar N=4 super Yang-Mills theory for any operator and any value of the 'tHooft coupling. It is based on the recent discovery of so called Y-system - a system of non-linear integral equations following from AdS/CFT correspondence and a (still mysterious) quantum integrability. I will try to explain the physical and mathematical origins of the Y-system and discuss some limiting cases which were checked, or can be checked, from more conventional methods. The Y-system represents the first known example of exact calculation of physical quantities in a 4D gauge theory given by non-trivial sums of Feynman graphs.

Tue May 4, 2010

### 3pm - 4pm Jose Barbon (Madrid, IFT) on "Metastable AdSs"

**Where:** Physics Department 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: I will describe two applications of semiclassical brane tunneling effects in AdS spacetimes: (1) spontaneous fragmentation of topological black holes and (2) a brane picture of Coleman-de Luccia bounces in the thin-wall approximation. The second example is used as a starting point for a discussion of holographic regularizations of Coleman-de Luccia crunch singularities in AdS.

## University of Crete HEP Seminars 2009/2010

Wed May 12, 2010

3pm - 4pm

**Andy O'Bannon (Munich, Max Planck) on "Holographic p-wave Superfluids and their Fermi Surfaces"**

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: Gauge-gravity duality is an extremely useful tool for studying strongly-coupled gauge theories, and has many applications to real-world systems. In particular, many quantum critical condensed matter systems, including (possibly) high-Tc superconductors, are described by strongly-coupled, scale-invariant theories. Some of the most valuable information about such systems comes from direct experimental measurements of their Fermi surfaces, which show (among other things) that they are non-conventional superconductors: for example, the Cooper pairs have a nonzero angular momentum quantum number (they are d-wave, not s-wave). In this talk I will present 1.) a gauge-gravity system that describes a phase transition to a p-wave superfluid state, and 2.) pictures showing the emergence of the Fermi surface, at isolated points, as we cool the system through the superfluid transition.

Thu May 13, 2010

3pm - 4pm

**Yumi Ko (CQUeST, Sogang) on "Meson spectra in a gluon condensate background"**

**Where:** Fermi Room, 1st floor, room 118

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: We study the spectra of light meson as well as the dissociation of bound states of heavy quarks and monopoles in a gluon condensate background. In order to describe the confining phase we introduce an IR cutoff in two ways, namely the hard wall and the braneless approaches. We find that the meson spectra strongly depend on the gluon condensate in the braneless approach, while they do not in the hard wall model. The latter result appears to be a more probable feature of QCD.

Fri May 14, 2010

3pm - 4pm

**Matti Jarvinen (Southern Denmark) on "Phases of gauge theories, technicolor, and holography"**

**Where:** Physics Department 2nd Floor Conference Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: Recently, there has been much progress in the understanding of phases of nonsupersymmetric gauge theories with fermions in generic representations of the gauge group. This progress has led to the identification of several phenomenologically viable walking technicolor theories. An important tool for recovering the phase diagrams of these theories has been a conjectured all orders beta function. On the other hand, beta functions have also been used recently to gain better control over the holographic duals of strong interactions. In this talk I will first give an introduction to the novel technicolor models, the phase diagram, and the conjectured beta function. Then I will discuss how this beta function can be used in the holographic framework.

## University of Crete HEP Seminars 2009/2010

**Tue May 18, 2010**

### **3pm - 4pm Giovanni Villadoro (CERN) on "Simple Z' in the early LHC"**

**Where:** Physics Department 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: Extra vector bosons are a common feature of many extensions of the Standard Model and represent one of the easiest smoking gun of new physics to look for. I will discuss present bounds from direct and indirect searches on the existence of extra spin-1 particles coupled to the Standard Model fields through renormalizable interactions and the possibility of an early discovery at the LHC.

**Wed May 19, 2010**

### **3pm - 4pm Chris Kouvaris (Brussels) on "Dark Matter from Technicolor Theories"**

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: I am going to present viable Technicolor models that pass the electroweak precision measurements. These models can be tested at LHC, and moreover they can provide elegant solutions for the dark matter problem. I'll discuss their phenomenology, the properties of the Technicolor dark matter WIMPs and their experimental constraints.

**Tue May 25, 2010**

### **3pm - 4pm Richard Woodard (Florida) on "The Zeta-Zeta Correlator Is Time Dependent"**

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: I comment on the recent arguments by Senatore and Zaldarriaga that loop corrections to the Zeta-Zeta correlator cannot grow with time after first horizon crossing. I first emphasize the need to search for such secular dependence in corrections whose in-out matrix elements are infrared singular on an infinite spatial manifold. Then I give examples of such time dependence from pure quantum gravity and from scalar potential models. Finally, I point out that this time dependence arises from inflationary particle production and is therefore unlikely to endanger the preservation of super-horizon correlations as a record of inflation.

**Tue Jun 1, 2010**

### **3pm - 4pm**

#### **Rene Meyer (Crete) on "Thermodynamics of Effective Holographic Theories for Condensed Matter Systems"**

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:** ABSTRACT: TBA

## University of Crete HEP Seminars 2009/2010

Fri Jun 4, 2010

### 3pm - 4pm Djordje Minic (Virginia Tech) on "String Theory and Many-Body Physics"

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: Recent theoretical advances in string theory relate in an unexpected way the physics of gravity in certain D dimensional space-times with the dynamics of quantum field theories living on the associated (D-1) dimensional space-time boundary. This unsuspected relationship offers a remarkable new tool for dealing with some outstanding problems in condensed matter physics. In the first part of the talk I aim to explain both the intuitive and technical underpinnings of these new developments. In the second half of the talk I will present some recent results on aging in systems far from equilibrium and also some new avenues for research in condensed matter physics which involve the interplay of gauge fields, membranes and many-body systems. In particular this last work opens up an exciting possibility for fundamentally new states of condensed matter.

Tue Jun 8, 2010

### 3pm - 4pm

#### Bom-Soo Kim (Crete) on "Charged Dilatonic Black Holes and their Transport Properties"

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: As a sequel of the Rene Meyer's talk, we would like to analyze the transport coefficients, especially AC and DC conductivity, which is directly measurable in condensed matter experiments. The general scaling of DC resistivity with temperature at low temperature, and AC conductivity at low frequency and temperature across the whole range of parameters, is found. There is a codimension-one region where the DC resistivity is linear in the temperature.

Fri Jun 11, 2010

### 3pm - 4pm Matt Lippert (Crete) on "A Holographic Model of the Quantum Hall Effect"

**Where:** 2nd Floor Seminar Room

**Creator:** University of Crete HEP Seminars 2009/2010

**Description:**

ABSTRACT: We consider a system of fermions in 2+1 dimensions based on D7-brane probes in  $AdS_5 \times S^5$ . The system is stabilized by turning on appropriate fluxes. We analyze the system in the presence of a chemical potential and a magnetic field. We show that at low temperature the system is in a fractional quantum Hall state whose filling fraction depends on a single parameter. We also discuss the transport properties and the phase diagram of this system.