

# Future Prospects for Fundamental Particle Physics and Cosmology workshop Talk Schedule

Events for:  
Monday, May 4th - Friday, May 8th

## Monday, May 4th

9:00am **John Schwarz - SCGP 102**

**Title:** The Superspace Geometry of AdS<sub>5</sub> X S<sup>5</sup>

**Abstract:** Previous studies of the type IIB superstring in an AdS<sub>5</sub> X S<sup>5</sup> background are based on a description of the superspace geometry as a quotient space of the isometry supergroup PSU(2,2|4). I will describe an alternative approach in which the superspace geometry is described as a subspace of PSU(2,2|4). This approach leads to a superspace description of the geometry that looks quite different from the previous one. The new formulation keeps all bosonic symmetries manifest, and it provides the complete dependence on the Grassmann coordinates in terms of simple analytic expressions.

10:30am **Coffee Break**

10:45am **Ivo Sachs - SCGP 102**

**Title:** On Conformal Versus Scale Invariance in Four Dimensions

12:15pm **Lunch - SCGP Cafe**

1:15pm **Marc Henneaux - SCGP 102**

**Title:** Cosmological billiards, E(10) and hidden symmetries of gravity

2:45pm **Hermann Nicolai - SCGP 102**

**Title:** K(E10) as an R symmetry of M theory

**Abstract:** The maximally extended hyperbolic Kac Moody algebra E10 has been proposed as a possible candidate symmetry underlying M theory. Equally important is its 'maximal compact' subalgebra K(E10) which governs the fermionic sector of the theory and thus should play the role of an 'R symmetry' for M theory. In this talk I will review what little is known about it, and highlight recent progress in understanding some of its properties

4:15pm **Tea**

4:30pm **George Sterman - SCGP 102**

**Title:** Some topics from high energy QCD

**Abstract:** Quantum chromodynamics plays a leading role in the search for new physics at colliders, and this very search enables us to explore quantum field theory from novel and evolving perspectives. I'll touch of some connections to experiment, and suggest that approaching high energy QCD from a coordinate-space perspective may result in new insight.

**Tuesday, May 5th**

9:00am **Ali Chamseddine - SCGP 102**

**Title:** Quanta of Geometry

10:30am **Coffee Break**

10:45am **Costas Bachas - SCGP 102**

**Title:** Is Einstein's Gravity an Effective Theory?

**Abstract:** The answer is undeniably "yes", but there are some clouds that hang in the sky.

12:15pm **Lunch - SCGP Cafe**

1:15pm **Alexander Polyakov - SCGP 103**

**Title:**

2:45pm **Nathan Seiberg - SCGP 102**

**Title:** What is Quantum Field Theory?

4:15pm **Tea**

4:30pm **Cesar Gomez - SCGP 102**

**Title:**

**Wednesday, May 6th**

9:00am **Boris Altshuler - SCGP 102**

**Title:**

10:30am **Coffee Break**

10:45am **Dieter Luest - SCGP 102**

**Title:** Large N Graviton scattering, black hole & string production and some comments on string geometry

12:15pm **Lunch - SCGP Cafe**

1:15pm **Matias Zaldarriaga - SCGP 102**

**Title:** Constraining the properties of the Primordial seeds: Prospects for further progress

2:45pm **Jean-Loup Puget - SCGP 102**

**Title:** Constraints on the primordial universe from CMB observations, present situation and future prospects.

4:15pm **Tea**

4:30pm **Rashid Sunyaev - SCGP 102**

**Title:** unavoidable CMB Spectral Features and Blackbody Photosphere of Our Universe",

**Abstract:** Spectral features in the CMB energy spectrum contain a wealth of information about the physical processes in the early Universe,  $z \sim 2 \times 10^6$ . The CMB spectral distortions are complementary to all other probes of cosmology. In fact, most of the information contained in the CMB spectrum is inaccessible by any other means. This review outlines the main physics behind the spectral features in the CMB throughout the history of the Universe, concentrating on the distortions which are inevitable and must be present at a level observable by the next generation of proposed CMB experiments. The spectral distortions considered here include spectral features from cosmological recombination, resonant scattering of CMB by metals during reionization which allows us to measure their abundances,  $y$ -type distortions during and after reionization and  $\mu$ -type and  $i$ -type (intermediate between  $\mu$  and  $y$ ) distortions created at redshifts  $1.5 \times 10^4 \lesssim z \lesssim 2 \times 10^6$  due to viscous dissipation of the primordial sound waves.

6:00pm **Workshop Banquet Dinner**

**Thursday, May 7th**

9:00am **Pierre Ramond - SCGP 102**

**Title:** The case for a Family Symmetry

10:30am **Coffee Break**

10:45am **Edward Witten - SCGP 102**

**Title:** Some Remarks On Time Dependence In String Theory.

12:15pm **Lunch**

1:15pm **Lisa Randall - SCGP 103**

**Title:** Double Disk Dark Matter Abstract

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2:45pm **Thibault Damour - SCGP 102**

**Title:** Hidden Hyperbolic Kac-Moody Structures in Supergravity and a Possible Quantum Avoidance of Cosmological Singularities

**Abstract:** We shall review the evidence for a duality between 11-dimensional supergravity (and hopefully M-theory) and the dynamics of a spinning massless particle on the infinite-dimensional coset  $G(\mathbb{Z})\backslash G/K(G)$  where  $G=E_{10}$  is the hyperbolic Kac-Moody extension of  $E_8$ . We focus on recent work (arXiv:1406.1309) dealing with the quantum dynamics of the reduction of D=4 simple supergravity to a SU(2)-homogeneous cosmological model. Besides confirming the presence of hidden Kac-Moody structures, this study shows that the quantized contribution of the terms quartic in the Fermions generically leads to an avoidance of the zero-volume singularity, i.e. to a cosmological bounce. This suggests imposing the boundary condition that the wave function of the Universe vanish at zero volume, which leads to a type of final-state boundary condition when considering the big crunch inside a black hole

4:15pm **Tea**

**Friday, May 8th**

9:30am **Alexander Gorsky - SCGP 102**

**Title:** Microscopic aspects of the formation of condensates

10:00am **Emil Akhmedov - SCGP 102**

**Title:** Secularly growing loop corrections in de Sitter space

10:30am **Coffee Break**

11:00am **Ariel Zhitnitsky - SCGP 102**

**Title:** Dark energy from contact terms

11:30am **Discussions - SCGP 102**

12:00pm **Lunch - SCGP Cafe**

2:00pm **Tea - Math Common Room**

4:00pm **Iconic Wall Unveiling and Dedication - Wine and Cheese Reception - SCGP Lobby and Art Gallery**

