6th SwissMAP General Meeting

September 8-11, 2019 – Eurotel Victoria
(Villars-sur-Ollon)

Colloquium Talks

Hugo DUMINIL-COPIN (University of Geneva)

Title :

Marginal triviality of the scaling limits of critical Ising and φ^4 models in 4D

Abstract :

The question of constructing a non-Gaussian field theory, i.e. a field with non-zero Ursell functions, is at the heart of Euclidean (quantum) field theory. While non-triviality results in d<4 and triviality results in d>4 were obtained in famous papers by Glimm, Jaffe, Aizenman, Frohlich and others, the crucial case of dimension 4 remained open. In this talk, we show that any continuum phi^4 theory constructed from Reflection Positive lattice phi^4 or Ising models is inevitably free in dimension 4. The proof is based on a delicate study of intersection properties of a non-Markovian random walk appearing in the random current representation of the model. This is based on joint work with Michael Aizenman.

Rinat KASHAEV (University of Geneva)

Title :

The quantum dilogarithm and its applications

Abstract :

The quantum dilogarithm is a special function of two variables that finds various applications in mathematics and physics. Although a special case of that function was introduced already in 1886 by Hölder, its deep connections to quantum world were revealed only in early 1990's after the discovery of the quantum five term identity by Ludwig Faddeev. I will review its properties and applications in spectral theory, quantum integrable systems, and quantum topology.

Susanne REFFERT (University of Bern)

Title :

CFTs at Large Charge

Abstract :

The large-charge approach consists in studying conformal field theories in sectors of fixed and large global charge. This allows performing a perturbative expansion of a generically strongly-coupled theory with the inverse charge acting as a controlling parameter. In this talk, I will present the basic idea of the large-charge expansion using the simplest example of the 3D O(2) model at the Wilson-Fisher fixed point, as well as its application to other models.

Benjamin Schlein (University of Zurich)

Title :

Bogoliubov excitation spectra for Bose-Einstein condensates

Abstract :

We consider systems of N trapped bosons interacting through a repulsive potential with scattering length of the order 1/N (Gross-Pitaevskii regime). We determine the low-energy spectrum of the Hamilton operator in the limit of large N. Our results confirm the predictions of Bogoliubov theory. This talk is based on joint work with C. Boccato, C. Brennecke and S. Cenatiempo.

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Innovator Prize Winner's Talks

Nina HOLDEN (ETH Zurich)

Title :

Cardy embedding of uniform triangulations

Abstract :

A random planar map is a canonical model for a discrete random surface which is studied in probability theory, combinatorics, mathematical physics, and geometry. Liouville quantum gravity is a canonical model for a random 2D Riemannian manifold with roots in the physics literature. In a joint work with Xin Sun, we prove a strong relationship between these two natural models for random surfaces. Namely, we prove that the random planar map converges in the scaling limit to Liouville quantum gravity under a discrete conformal embedding which we call the Cardy embedding.

Lorenz EBERHARDT (ETH Zurich)

Title :

An exact AdS/CFT duality

Abstract :

In this talk, I will review the AdS/CFT correspondence with particular emphasis on the AdS3/CFT2 case. In this setting, I will discuss the AdS/CFT duality between string theory on AdS3 and the symmetric product orbifold CFT. This is the first instance of a stringy AdS/CFT correspondence where both sides are solvable and the correspondence can be proved. I will explain the various checks that have been performed and what they teach us about the underlying physics of the holographic duality.

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Short Talks

Johannes ALT (University of Geneva)

Title :

Extreme Eigenvalues of critical Erdős-Rényi graphs

Abstract :

In this talk, we present recent results on the extreme eigenvalues of the adjacency matrix of Erdős-Rényi graphs. The Erdős-Rényi graph G has N vertices and any two vertices are connected with probability p, independently of other edges. If p is large then the adjacency matrix A of G behaves like a Wigner random matrix and has the semicircle law on [-2,2] as limiting eigenvalue density. Moreover, the extreme eigenvalues converge to -2 and 2, respectively. If p is small then, however, A has many eigenvalues outside of [-2,2]. Recently, the critical value of p for this transition has been determined and a precise connection between the large degrees of G and the extreme eigenvalues of A has been established.

This is joint work with Raphael Ducatez and Antti Knowles.

João Pedro ALVES DA SILVA (EPFL)

Title :

Four Point Functions in CFT's with slightly broken higher spin symmetry

Abstract :

We compute four point functions of single trace operators in three dimensional conformal field theories with slightly broken higher spin symmetry at finite t'Hooft coupling. Examples of such theories are large N Chern-Simons theories coupled to matter in the fundamental representation.

Thiago ARAUJO (University of Bern)

Title :

Nonlocal charges from marginal deformations of 2D CFTs

Abstract :

The presence of nonlocal charges in a 2D QFT often denotes its integrability and/or the presence of hidden symmetries which are not fully understood nowadays. In this talk I want to consider the construction and the algebra of nonlocal charges from marginal deformations of 2D CFTs. Moreover, I discuss how these objects may help us to fathom an important class of integrable theories: the Yang-Baxter sigma models.

Short Talks

Fathi BEN ARIBI (University of Geneva)

Title :

The Teichmüller TQFT volume conjecture for twist knots

Abstract :

In 2014, Andersen and Kashaev defined an infinite-dimensional TQFT from quantum Teichmüller theory. This Teichmüller TQFT is an invariant of triangulated 3-manifolds, in particular knot complements. The associated volume conjecture states that the Teichmüller TQFT of an hyperbolic knot complement contains the volume of the knot as a certain asymptotical coefficient, and Andersen-Kashaev proved this conjecture for the first two hyperbolic knots. In this talk I will present the construction of the Teichmüller TQFT and how we approached this volume conjecture for the infinite family of twist knots, by constructing new geometric triangulations of the knot complements.
No prerequisites in Quantum Topology are needed.

Joint project with E. Piguet-Nakazawa

Andrea DEI (ETH Zurich)

Title :

The integrable structure of stringy AdS3 WZW model

Abstract :

I discuss the integrable structure of the CFT2 describing superstrings on AdS3xS3xT4. Wess-Zumino-Witten energy levels are reproduced by a remarkably simple integrable model with exactly solvable Bethe equations, paving the way to a firm contact between integrability and CFT2 techniques.

Jie GU (University of Geneva)

Title :

Non-perturbative approaches to the quantum Seiberg-Witten curve

Abstract :

We study various non-perturbative aspects of the quantisation of the Seiberg-Witten curve of the N=2 SU(2) super Yang-Mills theory, which is closely related to the modified Mathieu operator. The first aspect is the resurgent properties of the quantum WKB periods, which we find to be encoded in a set of TBA equations determined by the BPS spectrum of the gauge theory. The second aspect is a closed formula for the Fredholm determinant of the modified Mathieu operator derived from the TS/ST correspondence.

Dennis HANSEN (ETH Zurich)

Title :

New developments in non-relativistic gravity

Abstract :

Statements about relativistic effects are often subtle. It will be discussed how the three classical tests of general relativity, namely perihelion precession, deflection of light and gravitational redshift, are passed perfectly by an extension of Newtonian gravity that includes gravitational time dilation effects while retaining a non-relativistic causal structure. We present its action and the equations of motion, which contains a generalization of the Poisson equation of Newtonian gravity. The construction requires a new notion of Newton-Cartan geometry based on a novel non-relativistic symmetry algebra. It will be explained how this geometry naturally arises in a covariant 1/c expansion of general relativity. Matter couplings, solutions of the theory and applications to holography will be discussed.

Marco MEINERI (EPFL)

Title :

Colliders and conformal interfaces

Abstract :

We probe a generic two dimensional conformal interface via a collider experiment. We measure the transparency of the interface by computing the energy which is reflected and transmitted during the scattering process. In the absence of extended symmetries, the result is independent of the details of the initial state and determined by the central charge and a single piece of CFT data.

Louis-Hadrien Robert (University of Geneva)

Title :

Categorification of 1 and of the Alexander polynomial

Abstract :

I will give a combinatorial and down-to-earth definition of the symmetric gl(1) homology. It is a (non-trivial) link homology which categorifies the trivial link invariant (equal to 1 on every link). Then I'll explain how to use this construction to categorify the Alexander polynomial.
Joint with Emmanuel Wagner

Fiona SEIBOLD (ETH Zurich)

Title :

Reconciling integrable eta-deformations with supergravity

Abstract :

The eta-deformation of the Green-Schwarz action can be used to construct integrable deformations of superstrings on various AdS backgrounds. A long-standing question of interest is whether the deformed theories define critical string theories. In this talk, I will review the construction of the eta-model and discuss when the deformed backgrounds solve the supergravity equations of motion.

Manus VISSER (University of Geneva)

Title :

Emergent Gravity in Causal Diamonds

Abstract :

We derive the Einstein equation from the condition that every small causal diamond is a variation of a flat empty diamond with the same free conformal energy, as would be expected for a near-equilibrium state. The attractiveness of gravity hinges on the negativity of the absolute temperature of these diamonds, a property we infer from the generalized entropy.

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