

Curriculum Vitae-Mattia Cafasso

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Personal informations

Date of birth: 17 April 1981.

Place of birth: Genova (Italy).

Sex: Male.

Nationality: Italian.

Education

2004-2008

Ph.D. in Geometry, Sissa-Isas.

Dissertation: Block Toeplitz Matrices and Integrable Systems.

Advisor: Prof. Boris Dubrovin.

External Referee: Prof. Alexander Its.

2000-2004

Laurea *cum laude* in Matematica (Master Degree), University of Genoa.

Dissertation: Projective Structures, Opers and the KdV equation.

Advisor Prof. Claudio Bartocci.

Current Position:

Post-Doc Researcher at UCL (Université Catholique de Louvain), Belgium.

Research interest

Research area: Mathematical physics and geometry. Specifically:

Infinite-dimensional Grassmannians and integrable hierarchies.

Applications of Toeplitz operators to integrable hierarchies.

Orthogonal polynomials, matrix models and connections with integrable systems.

Publications:

M.Cafasso; Block Toeplitz determinants, constrained KP and Gelfand-Dickey hierarchies.

Mathematical Physics, Analysis and Geometry **11** (2008), no.1, 11-51.

M.Cafasso; Matrix biorthogonal polynomials on the unit circle and non-abelian Ablowitz-Ladik hierarchy.

ArXiv preprint: 0804.3572.

Grants and Honors:

2000-2004

Grant obtained by INDAM (Istituto nazionale di Alta Matematica)

for undergraduate students in Mathematics. Amount: 4.000 euros per year.

This grant is assigned every year through a competition among all first year italian students in mathematics. Renewal is given every year to students passing all exams with a mean value of 27 in a scale from 1 to 30, no marks lower than 24.

2005

Prize awarded by University of Genova.

In 2005, the University of Genova awarded for exceptional merits the top students among all faculties, all departments, and all classes.

May 2008-September 2008

Enigma Fellowship at the Early Stage Researcher (ESR) level

at UCL (Université catholique de Louvain) under the supervision of Prof. Pierre van Moerbeke.

(Enigma is a Marie Curie Research and training network.)

Teaching Experience

2005-2006

Teaching Assistance, Differential Geometry I (Prof. Ugo Bruzzo), Sissa-Isas.

2006-2007

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Delivered talks

Frobenius manifolds and Givental's twisted loop group, 21-09-2006, Università' di Genova (on invitation).

KP equation and Grassmannians I (Introduction), 14-12-2006, Sissa.

KP equation and Grassmannians II (Kac-Schwarz operator and Witten-Kontsevich tau function), 25-01-2007, Sissa.

Quantization of quadratic hamiltonians and geometry of Frobenius structures, 02-05-2007, Sissa.

Toeplitz determinants and integrable hierarchies, 18-01-2008, Università' di Milano Bicocca (invited and funded by Università' di Milano Bicocca).

Toeplitz determinants and integrable hierarchies, 25-01-2008, Università' di Genova (on invitation).

Matrix biorthogonal polynomials on the unit circle and non abelian Ablowitz-Ladik hierarchy, 9-06-2008, IAP meeting for the group Nonlinear systems, stochastic processes, and statistical mechanics, Ghent.

Recurrence relations for orthogonal polynomials and semidiscrete zero-curvature equations, 25-06-2008, Workshop on Moduli Spaces, Enumerative Geometry and Integrable Systems, Università' di Genova (on invitation, funded by Enigma's grant).

Matrix biorthogonal polynomials on the unit circle and non abelian Ablowitz-Ladik hierarchy, 4-07-2008, Workshop on Geometric Methods in Mathematical Physics, Sissa.

Matrix biorthogonal polynomials on the unit circle and non abelian Ablowitz-Ladik hierarchy, 29-08-2008, Workshop on Random Matrices, Related Topics and Applications, CRM, Montreal (partially funded by CRM and Enigma's grant).

Matrix biorthogonal polynomials on the unit circle and non abelian Ablowitz-Ladik hierarchy, 8-09-2008, International Workshop on Orthogonal Polynomials and Approximation Theory, Universidad Carlos III, Madrid (funded by Enigma's grant).

Block Toeplitz determinants, Gelfand-Dickey equations and Riemann-Hilbert problems, 15-10-2008, Conference on Integrable Systems, Geometry, Matrix Models and Applications, Enigma Conference, Trieste (funded by Enigma's grant).

Research Project and Aim of the Visit: Replica Methods and Integrability.

The interplay between random matrices, integrable systems and random models is nowadays a very fruitful field of research. My current project of research is about integrability structures appearing in the study of brownian motions. Starting from the pioneering works of Dyson, Karlin-Mc Gregor and Johansson it has been shown that non-intersecting brownian motions are very well connected with matrix models. Mark Adler and Pierre van Moerbeke also showed, in a series of papers, that brownian motions can be studied using the theory of multicomponent KP and related Virasoro constraints; namely the link between these two seemingly far theories lies on the use of multiple orthogonal polynomials and involves also the theory of Painlevé' transcendents. During my stay at Yad Hashmona I intend to collaborate with Professors Eugene Kanziiper. In 2002 Prof. Eugene Kanziiper showed that Toda lattice equations and Painlevé' transcendents can be used to study, in a rigorous way, some replica sigma models derived in the context of random matrix theory. I intend to discuss with Prof. Eugene Kanziiper the relationship between replica methods and integrability through orthogonal polynomials. Eventually this study could be a first step to extend the applications of replica methods to some random models, such as brownian motions, mathematically described by orthogonal polynomials. I also intend to follow the workshop on Random Matrices and Integrability and the lectures given by Prof. Alexander Its and Prof. Craig Tracy in the framework of the Batsheva Fellowship. Infact both these two events are closely related to my research interests.