

# Proceedings of the Workshop on Noncommutative Field Theory and Gravity, September 8–12, 2010, Corfu, Greece

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It is generally expected that due to the interplay between gravity and quantum mechanics, the classical picture of smooth spacetime manifolds should be replaced by some kind of quantum geometry at very short scales. Much research has been devoted to this question in the past from various points of view. In particular, the study of quantum field theory on non commutative spacetimes has been developed as an effective approach to study physical models on quantum spaces. The workshop has been focused mainly

1. on various aspects of field theories defined on noncommutative spaces and
2. on the relation among quantum, non commutative geometries and gravity in different approaches.

The Editors

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*Corfu Summer Institute on Elementary Particles and Physics - Workshop on Non Commutative Field Theory and Gravity  
September 8-12, 2010  
Corfu Greece*

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## 1. Foreword

These are the Proceedings of the Workshop on Noncommutative Field Theory and Gravity, which took place in Corfu during 8th - 12th September 2010 in Corfu. The Workshop was one of scientific activities of the Corfu Summer Institute “Schools and Workshops on Elementary Particle Physics and Gravity” (CORFU2010) from August 29th to September 19th 2010. We refer to the website <http://www.physics.ntua.gr/corfu2010> for all organizational and practical details.

The Corfu Summer Institute has a very long, interesting and successful history. The Corfu Meeting started in 1982 as a Summer School on EPP mostly for Greek graduate students and since then it has developed into a leading international Summer Institute in the field of Elementary Particle Physics (covering both experimental and theoretical advances) and more recently of Gravity. In addition, it launched a very rich outreach program to teachers and school students that has been widely appreciated by the local society and scientific community over the years. The structure of CORFU2010 Summer Institute on EPP and Gravity was based on the general format developed and established and tested in all previous Corfu Meetings. This year it was hosted for the second time by the newly established European Institute for Sciences and their Applications (EISA). The new Institute aims to serve as permanent extension of the Corfu Summer Institutes with the additional target to attract first class scientists that can stay for a long period and produce locally a significant research output. The scientific activities of CORFU2010 were held mostly in the conference hall of the garden of Mon Repos in the town of Corfu, which is the expected permanent basis of EISA.

The Workshop on Noncommutative Field Theory and Gravity was hosted in the Mon Repos Palace. The scope was to provide an up-to-date educational introduction to the main research topics in the field of Noncommutative Field Theory and Gravity, followed by seminars by leading international experts in order to provide the link to the current research.

The Scientific Organizers were D. Bahns, H. Grosse and G. Zoupanos.

The Workshop was coorganized and supported by the

- QG: Quantum Geometry and Quantum Gravity Research Networking ESF Programme,
- Courant Research Centre “Higher Order Structures in Mathematics”, Goettingen
- National Technical University of Athens

and supported by the Corfu Municipality.

The Workshop was a very successful scientific event from every respect. Six reviewers have presented introductory lectures covering the various research directions of the general field of Non-commutative Field Theory and Gravity. Moreover 35 senior and young scientists have presented their current research projects. The total number of participants was around 90. Various details of the Scientific Meeting can be found in the homepage:

<http://www.physics.ntua.gr/corfu2010/nc.html>

The invited review lecturers and the titles of their talks were the following:

**S. Doplicher:** Distance, area and volume operators on Quantum Spacetime

**M. Henneaux:** E(11), Borcherds Algebras and Maximal Supergravity

**D. Vassilevich:** Covariant star products

**R. Szabo:** Branes, Quantization and Fuzzy Spheres

**V. Rivasseau:** Towards Renormalizing Group Field Theory

**M. Reuter:** Running Immirzi Parameter and Asymptotic Safety

The full programme of the Workshop was the following:

<b>September 9, 2010</b>		
9:00 -9:45	S. Doplicher	Distance, area and volume operators on Quantum Space-time
9:50-10:35	M. Henneaux	Asymptotic behaviour of gravity in three dimensions
11:20-12:05	D. Vassilevich	Covariant star products
12:10-12:40	B. Dolan	Enthalpy and the first law of black hole thermodynamics
12:40-13:10	G. Piacitelli	Models of Quantum Spacetime, and covariance
16:00-16:30	J. Hoppe	Discrete Curvature
16:30-17:00	A. Sitarz	Noncommutative Geometry with Torsion
17:30-18:00	V. Kupriyanov	Noncommutativity with mixed spacial and spin degrees of freedom
18:00-18:30	L. Jonke	Realization of symmetries on non-commutative spaces
18:30-19:00	G. Barnich	Aspects of the BMS/CFT correspondence
19:00-19:30	P. C. Martin	Nc GUTS: A status Report

  

<b>September 10, 2010</b>		
9:00 -9:45	R. Szabo	Branes, Quantization and Fuzzy Spheres
9:50-10:35	V. Rivasseau	Towards Renormalizing Group Field Theory
11:20-12:05	M. Reuter	Running Immirzi Parameter and Asymptotic Safety
12:10-12:40	J. Zahn	Divergences in QFT on the Noncommutative Minkowski Space with Grosse-Wulkenhaar potential
12:40-13:10	D. Bahns	On the Ultraviolet-Infrared Mixing Problem on Moyal space
16:00-16:30	G. Fiore	On twisted symmetries and QM with a magnetic field on NC tori
16:30-17:00	M. Wohlgenannt	Noncommutative gauge theory and renormalisability
17:30-18:00	L. Castellani	Noncommutative supergravity
18:00-18:30	P. Aschieri	Noncommutative Gerbes
18:30-19:00	H. Steinacker	Emergent gravity from Yang-Mills Matrix Models
19:00-19:30	D. Blaschke	Special geometries emerging from Yang-Mills type matrix models

<b>September 11, 2010</b>		
9:00 -9:30	F. Lizzi	Spectral Action from Anomalies
9:30 10:00	P. Vitale	Quantum corrections in the group field theory formulation of the PRL/FK models
10:00-10:30	A.de Goursac	Noncommutative field theories with harmonic term
11:00-11:30	M. Buric	Gauge fields on truncated Heisenberg space
11:30-12:00	J. Madore	Weak Gravitational Fields and Perturbations of the Flat-Space Noncommutative Algebra
12:00-12:30	A.Schenkel	Quantum Field Theory on Curved Noncommutative Space-times
12:30-13:00	A.Chatzistavrakidis	Fuzzy extra dimensions and particle physics models
16:00-16:30	M. Katanaev	Tube dislocations in gravity
16:30-17:00	T. Ioannidou	Noncommutative Baby Skyrmiions
17:30-18:00	A.Doikou	Integrable quantum spin chains and their classical counterparts
18:00-18:30	M. Sakellariadou	Cosmology with the Noncommutative Geometry Spectral Action
18:30-19:00	M. Arzano	Anatomy of a deformed symmetry: Field quantization on curved momentum space
19:00-19:45	Discussion	

Most of the presentations appeared on line in the CORFU2010 homepage just after they were delivered: <http://www.physics.ntua.gr/corfu2010/lectures.html>

All presentations were followed by short discussion sessions which were extended over the various breaks. A very interesting final discussion session was led by F. Lizzi. The general feeling was that the Workshop was very successful and was very beneficial for all participants. The senior scientists had the opportunity to learn all the current developments in the fields that have been discussed in an exciting and inspiring scientific atmosphere, which is expected to lead to new collaborations and interesting results. The young researchers, who have been attracted by this very exciting Workshop have received a good background to start working on their doctoral theses and the inspiration and enthusiasm for a successful completion of their research work.

We sincerely thank everybody who contributed to the success of the Workshop on Noncommutative Field Theory and Gravity, all speakers, the LOC and the conference secretary Mrs Ifigenia Moraiti. Finally, we wish to express our gratitude to our sponsors whose financial contribution made it all possible.

The Editors

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