

**SEENET-MTP**  
**WORKSHOP QM2005**

**Quantum Models on Noncommutative and  
Deformed Spaces**

&

**Annual Meeting  
of the Executive Committee of the Network**

November 3-7 2005

Nis, Serbia

Editors: G. Djordjevic and Lj. Nestic

**BOOK OF ABSTRACTS**

Southeastern European Network in Mathematical and Theoretical Physics

Section of Serbian Physical Society – Nis

Faculty of Science and Mathematics, University of Nis

2005

## **Organizing Committee**

**Goran Djordjevic, chairman**

**Ljubisa Nesic**

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# Programme

## THURSDAY, 03. November

ARRIVAL

## FRIDAY, 04. November, University of Nis, Small hall

08:00-09:30 Breakfast

10:00-10:30 OPENING

**Chairman: M. Dugic**

10:30-11:30 **B. Aneva:** *Stochastic models and Frobenius algebra*

11:30-12:30 **C. Sochichiu:** *Discrete models of AdS/CFT correspondence*

LUNCH

**Chairman: R. Constantinescu**

16:00-17:00 **S. Waldmann:** *Introduction to deformation quantization*

17:00-18:00 **M. Milekovic:** *Deformed oscillators and Calogero model*

COFFE BREAK

18:15-19:00 **Guest lecture: F. Munteanu:** *Second order partial differential equations (SOPDE's) and nonlinear connections on the tangent bundle of  $k^1$ -velocities of a manifold*

20:00- DINNER

## SATURDAY, 05. November, Faculty of Science, hall 100

08:00-09:30 BREAKFAST

**Chairman: Z. Maric**

10:30-11:30 **J. Wess:** *Gravity on deformed space*

11:30-12:30 **S. Waldmann:** *Locally noncommutative space-times*

12:30-13:00 **Reception: Dean, Faculty of Science**

13:00-14:00 **LUNCH: Club, Faculty of Science**

16:30-18:30 **MEETING OF THE EXECUTIVE COMMITTEE**

20:00 **DINNER: Host: Dean of the Faculty of Science**

**SUNDAY, 06. November, Faculty of Science, hall 100**

**08:00-09:30**      **BREAKFAST**

**Chairman: Lj. Nesic**

**10:00-11:00**      **G. Djordjevic:** *Quantum cosmology on real, nonarchimedean and noncommutative spaces*

**11:00-12:00**      **V. Radovanovic:** *Renormalizability of noncommutative  $SU(N)$  gauge theory*

**12:00-14:00**      *Visit of the MEDIANA museum*

**14:00-**              **LUNCH**

**17:00**              **DISCUSSION - University of Nis**

**20:00**              **DINNER**

**MONDAY, 07. November**

**08:00-09:30**      **BREAKFAST**

**09:30-**              **DEPARTURE**

## **DISCRETE MODELS OF ADS/CFT CORRESPONDENCE**

**Corneliu Sochichiu**

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I plan to discuss the dynamical models arising in the analysis of the  $N = 4$  supersymmetric Yang – Mills model in the context of AdS/CFT correspondence. Among these: the spin bit and the matrix models which are describing the dilatation operator of the super Yang – Mills model.

## **INTRODUCTION TO DEFORMATION QUANTIZATION**

**Stefan Waldmann**

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In this talk I will give a brief introduction to the basic concepts in deformation quantization, with particular focus on the relation between observable algebras and states.

## **DEFORMED OSCILATORS AND CALOGERO MODEL(S)**

**Marijan Milekovic**

Department of Physics, University of Zagreb  
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I review some algebraical (oscillator) aspects of the N-body single-species and multispecies Calogero models. I treat them as particular cases of deformed harmonic oscillators and discuss corresponding Fock spaces.

## **STOCHASTIC MODELS AND FROBENIUS ALGEBRA**

**Boyka Aneva**

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## **RENORMALIZABILITY OF NONCOMMUTATIVE $SU(N)$ GAUGE THEORY**

**Voja Radovanovic**

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We analyze the renormalizability properties of pure gauge noncommutative  $SU(N)$  theory in the  $\theta$ -expanded approach. We find that the theory is one-loop renormalizable to first order in  $\theta$ .

## **SECOND ORDER PARTIAL DIFFERENTIAL EQUATIONS (SOPDE'S) AND NONLINEAR CONNECTIONS ON THE TANGENT BUNDLE OF $K^1$ - VELOCITIES OF A MANIFOLD**

**Florian Munteanu**

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I will introduce two distinct ways by which it obtain a sequence of SOPDEs and a sequences of nonlinear connections on the tangent bundle of  $k^1$   $k^1$ -velocities  $T_k^1 M$ , starting from a given SOPDE. Properties about these sequences are presented. Interesting cases appear in the presence of a regular Lagrangian  $L$  on  $T_k^1 M$ .

## **LOCALLY NONCOMMUTATIVE SPACE-TIMES**

**Stefan Waldmann**

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In this talk I will report on a joint work with Dorothea Bahns on a new model for space-time noncommutativity: we propose a framework in which one can consistently speak about noncommutative effects only at small distances while at large distances ordinary geometry is preserved. The main idea relies on a careful investigation of the notion of "distance".

## QUANTUM COSMOLOGY ON REAL, NONARCHIMEDEAN AND NONCOMMUTATIVE SPACES

**Goran S. Djordjevic and Ljubisa Nestic**

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We consider basically (4+D)-dimensional Kaluza-Klein cosmological model with a Friedman-Robertson-Walker type of metric with two scaling factors. One of the scaling factors corresponds to the D-dimensional internal space, and second one to the 4-dimensional Universe. For the D=1 case we consider corresponding 2-dimensional minisuperspace archimedean, nonarchimedean and noncommutative quantum model. In addition, we explore evolution of this model and its generalization. We discuss perspectives of this approach, in particular, calculation and comparison of the wave function of the Universe in commutative as well as noncommutative case.

## GRAVITY ON DEFORMED SPACE

**Julius Wess**

LMU Munich,  
Theresienstrasse 37, 80333 Munich, Germany  
and  
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A deformation of the algebra of diffeomorphisms is constructed for canonically deformed spaces with constant  $\theta$ . The algebraic relations remain the same, whereas the comultiplication rule (Leibniz rule) is different from the undeformed one. Based on this deformed algebra a covariant tensor calculus is constructed and all the concepts like metric, covariant derivatives, curvature and torsion can be defined on the deformed space as well. The construction of these geometric quantities is presented in detail. This leads to an action invariant under the deformed diffeomorphism algebra and can be interpreted as a  $\theta$ -deformed gravity theory. The metric or the vierbein field will be a dynamical variable as in the undeformed theory.

# Participants

**Boyka Aneva** (Sofia, Bulgaria)

**Constanta Dana Constantinescu** (Craiova, Romania)

**Radu Constantinescu** (Craiova, Romania)

**Goran Djordjevic** (Nis, SCG)

**Dragoljub Dimitrijevic** (Nis, SCG)

**Miroljub Dugic** (Kragujevac, SCG)

**Jasmina Jeknic** (Nis, SCG)

**Marijan Milekovic** (Zagreb, Croatia)

**Milan Milosevic** (Nis, SCG)

**Florian Munteanu** (Craiova, Romania)

**Ljubisa Nestic** (Nis, SCG)

**Voja Radovanovic** (Belgrade, SCG)

**Jelena Stankovic** (Nis, SCG)

**Corneliu Sochichiu** (Chisinau, Moldova/Munich, Germany)

**Stefan Waldmann** (Freiburg, Germany)

**Julius Wess** (Munich, Germany)