



KARL-FRANZENS-UNIVERSITÄT  
GRAZ

**DOKTORATSKOLLEG GRAZ**

**"Hadrons in Vacuum, Nuclei and Stars"**

**in collaboration with the European Graduate School Basel- Tübingen**

## **Lecture Series of Prof. Dr. D. Diakonov**

(Petersburg Nuclear Physics Institute)

### **Yang – Mills as gravity theory, gravity as Yang – Mills theory**

Lecture I, Friday, 26<sup>th</sup> of November 2010, 10:30-12:00, SR 05.11

Lecture II, Monday, 29<sup>th</sup> of November 2010, 10:30-12:00, SR 05.11

Lecture III, Friday, 3<sup>rd</sup> of December 2010, 10:30-12:00, SR 05.11

Contents:

1. Yang – Mills theory in 2,3,4 dimensions on a lattice. Explicit parameterization of  $SU(N)$  groups. Invariant group measures.
2. Wigner D functions,  $3j$ ,  $6j$  symbols. Geometrical meaning of  $6j$  symbols, and large- $j$  asymptotics.
3. Duality transformation of Yang – Mills theory on a lattice in 3d. Triangulation of the 3d space. Regge's Quantum Gravity.
4. Riemann geometry and General Relativity in various formalisms.
5. Yang – Mills theory in 3d as Quantum Gravity with 'aether'.
6. Yang – Mills theory in 4d in a gauge invariant dual formulation. The mass gap.
7. Fermions in General Relativity and the Standard Model.
8. Towards unifying Quantum Gravity with the Standard Model.