INVITATION.

Sackler Distinguished Lectures in Mathematics

at Tel Aviv University

Professor **Boris Feigin**

Landau Institute for Theoretical Physics, Moscow

will deliver the series of Sackler Distinguished Lectures in Mathematics for the year 2008-2009 on the topic

"Quantum group construction of maximal commutative subalgebra inside the universal enveloping algebra of an affine Kac-Moody algebra"

The lectures will be held at Tel Aviv University.

Here is the schedule of the lectures and the abstract.

Lecture 1(Colloquium) **Review of quantum group approach - why quantum groups are so efficient.**

Monday, November 3, 2008, 12:15 - 13:15, Schreiber building, room 06

Lecture 2. **Center on a critical level and Langlands duality. Center on a critical level for quantum affine Kac-Moody algebra.**

Wednesday, November 5, 2008,at 16:00 - 17:00, Kaplun Building, room 118

Lecture 3. **Action of the center of affine quantum algebra in the representation of (non-affine) Kac-Moody algebra.**

Thursday, November 6, 17:00 - 18:00, Schreiber building, room 06

I am looking forward to see you at the lectures

Joseph Bernstein

Abstract of lectures by Professor B. Feigin.

I will try to explain the role of quantum groups in mathematics. Sometimes quantum groups appear naturally - sometimes not, but they give us understanding and technical tools to solve problems or to create the new ones. Surely the idea of symmetry is so natural for human beings because of evident reason. The concepts of beauty and symmetry are very close.

So the theory of quantum group studies the new type of symmetry and as a theory it is beautiful in itself.

Well, but the real question is why the quantum groups are so efficient (and also so popular)? The idea of symmetry is universal and deep but at the same time trivial.

For example, consider one of the most well-known applications of the quantum groups - the construction of invariants of knots and of 3-dimensional manifolds.

When you study this topological subject you get the mixed feeling. From one side you definitely see the manifestation of the idea of quantum symmetry. Especially it is clear from the point of view of the topological field theory.

However at the same time you feel that the real essence is in some combination - quantum group and "something" and this "something" is rather elusive.

You find many interesting technical ideas, find deep connections with very different parts of mathematics. So you see the complicated net of details, definitely feel something important behind, but you can not catch it.

Historically quantum groups appear as a part of the theory of quantum integrable system. And still the main applications are there. Quantum groups are used as a tool for constructing the "big" commutative subalgebras inside some associative algebras; after that we can diagonalize the action of these commutative algebras in representations.

I am planning to review the known construction of the "big commutative subalgebras" and present several new results. I would like to remark that the situation here is similar to the one in the theory of invariants of knots and 3-manifolds. Again the huge amount of ideas, technical details , connections with other theories – and something mysterious hidden behind.

More concretely I will talk about the following subjects.

1. R -matrix construction of commutative subalgebras

2. Construction of commutative subalgebras using the representation theory of affine Kac-Moody algebras "on the critical level". Connections with Langlands duality.

3."Center on a critical level" for a quantum affine Kac-Moody algebra.

4. Commutative subalgebras inside universal enveloping of affine Kac-Moody algebras.

5. Quantization of classical integrable systems.