



## SFB-Seminartag

### ZEIT:

17.7.2007, 15:00 Uhr - 19:00 Uhr

### ORT:

Humboldt-Universität zu Berlin  
Invalidenstr. 42, Nordbau, Hörsaal 8

### PROGRAMM:

15:00 - 16:00 **Prof. Dr. Herbert Kurke**

#### **On the geometric Langlands Conjecture**

Abstract: Due to the very limited time I have to pretend that everybody in the audience knows things like "algebraic stacks" (which intuitively is something like an algebraic variety where every point carries some extra-information), "derived categories", "theory of  $-$ modules" (a slight generalization of "holomorphic vectorbundle endowed with a flat meromorphic connection") etc. (Some more details I will give in a talk in the seminar "Algebraic Geometry" at FU, Monday, July 16, 4 pm - 6 pm in Arnimallee 3, SR 119.)

First we explain Langland-duality for reductive groups  $G, G'$ , this means: The lattice  $X(T')$  is dual to the lattice  $X(T)$  ( $T, T'$  maximal tori in  $G, G'$ ,  
) such that the rootsystem  
of  $G'$  is the corootsystem of  $G$  (and vice versa). E.g.  $SL_n$  and  $PSL_n$  are Langlands dual,  $SO(2n+1)$  and  $Sp(2n)$  are Langlands dual, whereas  $SO(2n)$  or  $GL_n$  are both Langlands-dual to itself:

Now, let  $X$  be a compact Riemann surface. We have various geometric objects associated with it, for example, for each reductive group  $G$ :

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the algebraic stack of holomorphic  $G$ -principal bundles  
;  
the algebraic stack of local systems  
( $G$ -bundles with a flat holomorphic connection, analytically it is the  
space  
conjugation).

Both are smooth stacks, and standard techniques, e.g. theory of coherent sheaves, theory of  $\mathcal{O}_X$ -modules, and its derived categories are available.

The GLC is the following: One expects an equivalence between compactly supported derived categories (of bounded complexes) of coherent sheaves on  $X$  and of coherent  $\mathcal{O}_X$ -modules on  $X$ .  
. Moreover, this correspondence should associate to points  $[E]$  of  $\mathcal{M}_g$  (identified with the 1-dimensional skyscraper-sheaf supported in  $[E]$ ) so-called "automorphic  $\mathcal{O}_X$ -modules" = "Hecke-Eigensheaves to  $E$ ". We will explain this notion in some detail, and results obtained in this direction.

If time permits we also will explain how GLC is related to the "classical" Langlands conjecture for global fields (= theorem of Lafforgue, for function fields over finite fields).

16:00 - 16:15 Pause

16:15 - 17:15 **Prof. Norman Dancer**

### **Finite morse index solutions of exponential problems and applications**

We discuss finite Morse index solutions of problems with exponential nonlinearities on unbounded  $N$ -dimensional domains and use these results to solve a classical problem on the bifurcation of solutions of nonlinear elliptic equations on bounded domains where the nonlinearity is of exponential type.

17:15 - 17:45 Kaffeepause

17:45 - 18:45 **Prof. Alexander Grigoryan**

### **Stability of the Harnack inequality for the heat equation and applications**

We are concerned with the uniform Harnack inequality and heat

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kernel estimates for the heat equation on weighted Riemannian manifolds. We show that the Harnack inequality is stable under certain non-uniform changes of weight and give applications to the heat kernels of Schroedinger operators in the Euclidean spaces.

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