Automorphic Forms, Geometry and Arithmetic

Workshop February 11 - February 24, 2007
Erwin Schrödinger International Institute for Mathematical Physics
Boltzmanngasse 9, 1090 Vienna , Austria
organized by

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This program will focus on several aspects of the theory of automorphic forms with an emphasis on the relations among the functoriality principle, formulated by R. P. Langlands in 1967, automorphic L-functions, Galois representations and questions in arithmetic algebraic geometry, in particular, those regarding Shimura varieties. The organizers intend to focus on the following topic areas where there have been a number of important recent developments.

1.Local representation theory

The local Langlands correspondence provides a conjectural parametrisation of L-packets of irreducible admissible representations of the group of F-points $G(F)$ of a reductive group over a local field F. Two questions of particular interest are the following:

(i) the description/construction of L - packets for classical groups

(ii) the Jacquet - Langlands correspondence for GL_n.

Some of the techniques in this area are purely local while others utilize global machinery from the theory of automorphic representations. In turn, the local results frequently play a role in the global theory.

2.Rankin-Selberg theory

In the language of automorphic representations, the classical method of Rankin-Selberg integrals has been vastly extended to provide integral representations, and hence analytic information, about many families of automorphic L-functions. Beside that, the descent method of Ginzburg, Rallis and Soudry had a far reaching impact on establishing the Langlands correspondence relating cuspidal generic automorphic representations of a classical group to those of a suitable general linear group.

3.Burger-Li-Sarnak method and applications

In important cases, the Burger-Li-Sarnak method controls the automorphic spectrum of a reductive group G in terms of a reductive subgroup H. By now the initial scope of the approach has been extended to cases of exceptional groups. Meanwhile, the methods of proof involved have been considerably simplified. These developments found several important applications, for example, in constructions of automorphic representations.

4.Cohomology of arithmetic groups and automorphic forms

The cohomology of an arithmetic subgroup of a reductive algebraic group G defined over some number field k can be interpreted in terms of its automorphic spectrum. Various techniques have been used, on the one hand, to analyze the internal automorphic structure of certain analytically defined subspaces of the cohomology (cuspidal, Eisenstein) and to establish the actual existence of specific types of automorphic representations in the automorphic spectrum, on the other. This subject is related in various ways with geometry and arithmetic algebraic geometry. Recent results include works on (non)-vanishing of cuspidal cohomology , special values of L-functions attached to cohomological automorphic representations and the arithmetic nature of Eisenstein cohomology classes.

List of Participants

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* = to be confirmed