

**Programme on
“Arithmetic Geometry and Automorphic Representations”**

April 7 - May 29, 2015

organized by

Stephen S. Kudla (U Toronto), Michael Rapoport (U Bonn), Joachim Schwermer (U Vienna)

Workshop II, Part 2, on

“Automorphic Forms - Geometry and Arithmetic”

May 11 - 15, 2015

• **Monday, May 11, 2015**

09:30 – 10:30 **Tobias Berger**

Bloch-Kato conjecture for Asai representations

10:30 – 11:00 *coffee / tea break*

11:00 – 12:00 **Jan Hendrik Bruinier**

Classes of Heegner divisors and traces of singular moduli

12:00 – 14:00 *lunch break*

14:00 – 15:00 **Torsten Wedhorn**

Generalized Hasse invariants

• **Tuesday, May 12, 2015**

09:30 – 10:30 **Colette Moeglin**

Around archimedean Arthur's packets

10:30 – 11:00 *coffee / tea break*

11:00 – 12:00 **Dihua Jiang**

Cuspidality of Certain Global Arthur Packets for Classical Groups

12:00 – 14:00 *lunch break*

14:00 – 15:00 **Eva Viehmann**

Affine Deligne-Lusztig varieties and the building of J

- **Wednesday, May 13, 2015**

9:30 – 10:30 **Wee Teck Gan**

The Langlands-Weissman Program for Brylinski-Deligne extensions

10:30 – 11:00 *coffee / tea break*

11:00 – 12:00 **Jean-Loup Waldspurger**

The fundamental lemma for the Hecke algebra in the twisted case

12:00 – 14:00 *lunch break*

14:00 – 15:00 **James W. Cogdell**

The local Langlands correspondence for $GL(n)$ and the exterior and symmetric square epsilon factors

- **Thursday, May 14, 2015**

Public Holiday - no talks

- **Friday, May 15, 2015**

10:00 – 11:00 **Sug Woo Shin**

Asymptotic behavior of supercuspidal characters

11:00 – 11:30 *coffee / tea break*

11:30 – 12:30 **Günter Harder**

Mixed motives and denominators of Eisenstein cohomology classes

All talks take place at the ESI, Boltzmann Lecture Hall!

Abstracts

Tobias Berger (University of Sheffield, UK)

Bloch-Kato conjecture for Asai representations

Following Ribet's seminal 1976 paper there have been many results employing congruences between stable cuspforms and lifted forms to construct non-split extensions of Galois representations.

I will explain how this strategy can be extended to construct elements in the Bloch-Kato Selmer groups of general \pm -Asai representations. I will discuss, in particular, how suitable congruences between polarized automorphic forms over CM fields always give rise to elements in the Selmer group for the parity of Asai representation (=tensor induction to maximal totally real subfield) that is critical in the sense of Deligne.

Jan Hendrik Bruinier (TU Darmstadt, Germany)

Classes of Heegner divisors and traces of singular moduli

In parallel to the Gross-Kohnen-Zagier theorem, Zagier proved that the traces of the values of the j -function at CM points are the coefficients of a weakly holomorphic modular form of weight $3/2$. Later this result was generalized in different directions and also put in the context of the theta correspondence. We recall these results and report on some newer aspects.

Torsten Wedhorn (University of Paderborn, Germany)

Generalized Hasse invariants

In this talk Hasse invariants for good reductions of Shimura varieties of Hodge type are constructed. This is joint work with J.-S. Koskivirta.

Colette Moeglin (U Paris, Jussieu, France)

Around archimedean Arthur's packets

In this talk I will explain what is the conjectural description of the A-packets in the archimedean case and how we can try to compute the local multiplicities. The case of the unitary cohomological representations is now done (joint work with Arancibia and Renard) and other cases are also available using theta series, as I will explain.

Dihua Jiang (University of Minnesota, USA)

Cuspidality of Certain Global Arthur Packets for Classical Groups

Following the endoscopic classification of Arthur, automorphic representations of classical groups in the discrete spectrum are assigned to be in certain sets, called global Arthur packets. It is important to find which global Arthur packets contain only cuspidal automorphic representations and which global Arthur packets contain only non-cuspidal discrete series automorphic representations.

Eva Viehmann (TU Munich, Germany)

Affine Deligne-Lusztig varieties and the building of J

We propose a new stratification of the reduced subschemes of Rapoport-Zink spaces and of affine Deligne-Lusztig varieties that highlights the relation between the geometry of these spaces and the action of the automorphism group of the p -divisible group determining the moduli space. We show that this provides a joint group-theoretic interpretation of well-known stratifications which only exist for special cases such as the Bruhat-Tits stratification of Voll.

Wee Teck Gan (U Singapore, Singapore)

The Langlands-Weissman Program for Brylinski-Deligne extensions

I will describe an evolving program to extend the Langlands philosophy to a wide class of nonlinear covering groups studied by Brylinski and Deligne, which was initiated by Finkelberg-Lysenko, McNamara and Weissman. If time permits, I will discuss work of my student Fan Gao on Langlands-Shahidi type L -functions as well as some considerations of functoriality in this setting.

Jean-Loup Waldspurger (U Paris, Jussieu, France)

The fundamental lemma for the Hecke algebra in the twisted case

Ngo Bao Chau has proved the fundamental lemma of the theory of endoscopy for the unit of the Hecke algebra. Using a global method due to Clozel, Hales has proved that, for ordinary endoscopy, this implies the same lemma for the whole Hecke algebra. In a joint work with Lemaire and Mœglin, we give another proof of the result of Hales, which is local and which works well in the case of twisted endoscopy. I will explain it.

James W. Cogdell (Ohio State University, USA)

The local Langlands correspondence for $GL(n)$ and the exterior and symmetric square epsilon factors

One of the hypotheses in the local Langlands correspondence is the agreement of the L - and epsilon-factors of pairs on the arithmetic and analytic sides. This correspondence is expected to be robust and preserve the factors for corresponding operations on the two sides, and in particular it should preserve the exterior and symmetric square L - and epsilon factors. Henniart has shown it preserves these L -factors and in recent work with Shahidi and Tsai we show the preservation of epsilon-factors. The proof is a robust local/global argument, combined with deformation techniques, which reduces the problem to the stability of the analytic gamma-factor under highly ramified twists for supercuspidal representations.

Sug Woo Shin (MIT, USA)

Asymptotic behavior of supercuspidal characters

This is joint work with Julee Kim and Nicolas Templier. The irreducible smooth representations of a p -adic reductive group are said to be supercuspidal if they do not appear in any induced representation from a proper parabolic subgroup. While it is still an open problem to obtain a precise character formula for them (apart from some special cases), I will explain that we can prove a reasonable upper bound and a limit formula as the formal degree tends to infinity, for a large class of supercuspidal representations. An expected application is an equidistribution result as well as a low-lying zero statistics for L -functions in a new kind of families of automorphic representations.

Günter Harder (MPI Bonn, Germany)

Mixed motives and denominators of Eisenstein cohomology classes

In my talk I will discuss a hypothesis concerning extensions of mixed Grothendieck - Tate motives. This hypothesis says that the Betti-de-Rham extension class and the ℓ -adic Galois cohomology are not “independent”.

Under this hypothesis I can derive some estimates for denominators of Eisenstein classes, which in turn imply congruences between eigenvalues of Hecke operators on different groups. These congruences can be verified. If time permits I will discuss a congruence between special values of cyclotomic L -functions which follows from the hypothesis.

This is discussed in detail in my manuscript

Mixed-Mot-2015.pdf in <http://www.math.uni-bonn.de/people/harder/Eisenstein>