Workshop Automorphic Galois Representations, L-functions and Arithmetic
Columbia June 17th-22nd, 2006

Saturday, June 17th

9:30 Welcome breakfast in the Lounge (5th floor)

10:00-11:30 Hida I
11:45-12:45 Vatsal

2:00-3:30 Urban I
3:45-5:15 Skinner I

Sunday, June 18th

9:30 Breakfast

10:00-11:30 Lapid I
11:45- 1:15 Cogdell I

2:30-3:30 Chai
3:45-5:15 Hida II

Monday, June 19th

9:00 Breakfast

9:30-11:00 Blasius
11:15-12:45 Lapid II

2:00-3:30 Kings I
3:45-5:15 Cogdell II

Tuesday, June 20th

9:00 Breakfast

9:30-11:00 Kings II
11:15-12:45 JS Li

2:00-3:30 Skinner II
3:45-5:15 Urban II

Wednesday, June 21th

9:00 Breakfast

9:30-10:30 Bellaiche
10:35-11:35 Mainardi
11:40- 12:40 Jacquet

2:00-3:00 Offen
3:05-4:05 Zhang
4:15-5:15 Ciperiani

6:00-10:00 Cocktail and Dinner

Thursday, June 22nd

Morning **Video-conference** in Uris Hall
9:00 Breakfast
9:30-11:00 Clozel (video conference Chevaleret/Columbia)
11:05- 12:35 Harris (video conference Chevaleret/Columbia)

Titles and Abstracts

Joel Bellaiche
Title: TBA
Abstract: TBA

Don Blasius
Title: Critical Values of L-functions
Abstract: We will review the Deligne Conjecture on critical values of L-functions, give classical examples, and a resume of the current state of that conjecture. In most examples, the proof of the conjecture involves two steps: (i) the identification of a critical value V with that P of a geometrically defined period integral; (ii) the proof of a theorem of period relations P=C where C is the period integral identified by Deligne. Most such relations are consequences of underlying relations of motives and we will describe this at work in examples. One profitable area to discuss is the study of relations between various critical values. Here results can be stated and proved in the automorphic setting without reference to motives and unproved facts about them.

Ching-Li Chai
Title: Hecke orbits and leaves
Abstract: On modular variety $\mathcal{M}$ of PEL-type over a field of characteristic p there are many prime-to-p Hecke correspondences. Closely related to the above Hecke symmetry is the "foliation structure" on $\mathcal{M}$. A leaf in the foliation structure is the locus in $\mathcal{M}$ determined by a (fixed) isomorphism class of Barsotti-Tate group with prescribed endomorphism. One expects that every Hecke orbit is dense in the leaf containing it. We will survey the methods developed for this conjecture. We will also present a general method for computing the p-adic monodromy group of a leaf.

Mirela Ciperiani
Title: Solvable points on genus one curves
Abstract: A genus one curve defined over Q which is locally trivial may not have a rational point. It is natural to study the classes of field extensions over which all such curves obtain a global point. I will explain how we have shown that every locally trivial genus one curve with semistable Jacobian has a point defined over a solvable extension of Q. This is joint work with A. Wiles.

Laurent Clozel
Title: Algebaric automorphic representations of GL(n) and unitary groups and Galois representations.

Jim Cogdell
Title: Integral representation of L-functions I & II

Abstract: The first talk will concentrate on $GL(n)$, since that is the case we know the most about and is the generalization of the classical theory. I will sketch the theory for $GL(n) \times GL(m)$ and say what we know and the things that are probably important to you that we do not know.

In the second talk I will deal with doubling and "twisted doubling" which give L-functions for classical groups without requiring Whittaker models and what little we know about L-functions for $G \times GL(m)$. I will again try to sketch the construction, what is known and how far we are from a full theory. I will concentrate on the case of unitary groups since this seems the most relevant for current applications."

Michael Harris
Title: Construction of automorphic Galois representations

Haruzo Hida
Title: Nonvanishing of L-values
Abstract: This series of two lectures is an introductory discussion of problems concerning nonvanishing of L-values modulo a prime p. Nonvanishing result has seen powerful applications in divisibility problems of class numbers and in many proofs of the main conjectures in Iwasawa's theory. Recently, new methods of proving nonvanishing have emerged in the work of Vatsal, Finis and myself. In these two lectures, we describe a geometric method, which was first applied by Sinnott to Dirichlet L-values and has been generalized to Hecke L-values via the theory of Shimura varieties. In the first lecture, we describe Sinnott's approach and give a description of modular curves as one of Shimura varities, and in the second, we study Hecke L-values.

Hervé Jacquet
Title: Introduction to the Relative Trace Formula
Abstract: The integral of a cusp form over the stabilizer of an involution is an interesting number, often related to special values of automorphic L ?functions. One can obtain information about this number by using a generalization of the standard trace formula. We will mainly discuss the case where the subgroup is a unitary group.

Guido Kings
Title: The equivariant Tamagawa number conjecture and the Iwasawa main conjecture I & II
Abstract: In this lecture we give an introduction to the Tamagawa number conjecture (TNC) and its relation to the Iwasawa main conjecture. To make the lectures more accessible we will focus mainly on the case of number fields or even abelian extensions of Q. We hope to explain clearly two lines of thought:

- The TNC is a generalization of the class number formula and its p-adic part can in fact be reduced to it.
- The equivariant TNC leads automatically to the correct formulation of an (non-abelian) Iwasawa main conjecture (and is essentially equivalent to it).

Erez Lapid
Title: Eisenstein series I & II

Abstract: Eisenstein series are central objects in the spectral theory of automorphic forms. In some sense they play the role of the exponential function in Fourier theory. In the first lecture I will focus on the case of $SL_2(R)$. The Eisenstein series on this group already exhibits many of its general features. Applications to the computation of the volume of the fundamental domain and the prime number theorem (with an error term) will be given. In the second lecture we turn to the higher rank case. We will review the general theory of Eisenstein series. I will hint to the use of Eisenstein series for analytic and arithmetic applications and to functoriality. (This theme will be elaborated by other speakers.)

Jian-Shu Li
Title: The Siegel-Weil formula and some of its applications
Abstract: We plan to review the Siegel-Weil formula in elementary terms. We shall then discuss some known applications, particularly in the construction of cohomology classes.

Fabio Mainardi
Title: The Eisenstein ideal for $U(2,1)$.
Abstract: We will explain the theory of the Eisenstein ideal for the unitary group U(2,1), and its application to the main conjecture for CM fields.

Omer Offen
Title: Periods of cusp forms over a compact unitary group.
Abstract: I will discuss an explicit formula for the period integral of certain cusp forms on GL(n) over a compact unitary group. The point of departure for the computation is an identity of Bessel distributions that follows from the relative trace formula of Jacquet. I will explain the main ingredients on which the computation is based. As an application, I will relate the result to a conjecture of Sarnak on the L-infinity norm of an automorphic form on a symmetric space. This is a joint work with Erez Lapid.

Chris Skinner
Title: The role of Eisenstein series in Iwasawa theory I & II

Abstract: I will discuss how Eisenstein series have been used in Iwasawa theory. Topics covered will include: Eisenstein measures (their use in constucting p-adic L-functions and p-adic interpolations of cuspidal Eisenstein series) and bounding the Eisenstein ideal (relating the congruence ideal for an Eisenstein series to L-values). Emphasis will be placed on the underlying ideas and the problems that arise in carrying them out.

Eric Urban
Title: Eisenstein Ideal and Hida Theory I & II
Abstract: I will present Hida theory for automorphic forms and its application to the study of the Eisenstein ideal. After reviewing the GL(2)-case, I will consider the case of quasi-split unitary groups $GU(n,n)$ and the Eisenstein ideal attached to Klingen type Eisenstein series in the case $n = 2$. Then I will explain the application to the Main conjecture for GL(2).

Nike Vatsal
Title: TBA
Abstract: TBA

Shou-Wu Zhang

Title: Period integrals and special values of L-functions

Abstract: Let G be a classical group and H a reductive subgroup of "Stiefel type". The purpose of this talk is to outline a procedure to evaluate period integrals over H of cusp forms on G. The result is roughly expressed as a special value of a standard L-function. This is a report of joint work in progress with Jian-Shu Li.