Banff International Research Station
for Mathematical Innovation and Discovery

Workshop on L-packets
26 June – 1 July, 2011

MEALS

*Breakfast (Buffet): 7:00–9:30 am, Sally Borden Building, Monday–Friday
*Lunch (Buffet): 11:30 am–1:30 pm, Sally Borden Building, Monday–Friday
*Dinner (Buffet): 5:30–7:30 pm, Sally Borden Building, Sunday–Thursday
Coffee Breaks: As per daily schedule, 2nd floor lounge, Corbett Hall
*Please remember to scan your meal card at the host/hostess station in the dining room for each meal.

MEETING ROOMS

All lectures will be held in Max Bell 159 (Max Bell Building accessible by walkway on 2nd floor of Corbett Hall). LCD projector, overhead projectors and blackboards are available for presentations. Note that the meeting space designated for BIRS is the lower level of Max Bell, Rooms 155–159. Please respect that all other space has been contracted to other Banff Centre guests, including any Food and Beverage in those areas.

SCHEDULE

Sunday

16:00	Check-in begins (Front Desk - Professional Development Centre - open 24 hours)
	Lecture rooms available after 16:00 (if desired)
17:30–19:30	Dinner (buffet), Sally Borden Building
20:00	Informal gathering in 2nd floor lounge, Corbett Hall (if desired)
	Beverages and a small assortment of snacks are available on a cash honor system.

Monday

07:00–08:45	Breakfast (buffet), Sally Borden Building
08:45–09:00	Introduction and Welcome by BIRS Station Manager, Max Bell 159
09:00–10:00	**James Arthur**: *Representations of orthogonal and symplectic groups*
10:00–10:30	Pause Café, 2nd floor lounge, Corbett Hall
10:30–11:30	**James Arthur**: *Representations of orthogonal and symplectic groups*
11:30–13:30	Lunch, Sally Borden Building
13:30–14:30	**Diana Shelstad**: *Some results in endoscopic transfer*
14:30–14:45	Pause Café, 2nd floor lounge, Corbett Hall
14:45–15:45	**Paul Mezo**: *Twisted spectral transfer for real groups*
16:00–16:15	Group Photo; meet on the front steps of Corbett Hall
17:30–19:30	Dinner, Sally Borden Building

Tuesday

07:00–09:00	Breakfast
09:00–10:00	**James Arthur**: *Representations of orthogonal and symplectic groups*
10:00–10:30	Pause Café, 2nd floor lounge, Corbett Hall
10:30–11:30	**James Arthur**: *Representations of orthogonal and symplectic groups*
11:30–13:30	Lunch
13:30–14:30	**Dipendra Prasad**: *Relative Local Langlands*
14:30–14:45	Pause Café, 2nd floor lounge, Corbett Hall
14:45–15:45	**Gordan Savin**: *Functoriality via matching of Hecke algebras*
17:30–19:30	Dinner

Wednesday

07:00–09:00	Breakfast
09:00–10:00	**Thomas Haines**: *Test functions for Shimura varieties with arbitrary level*
10:00–10:30	Café, 2nd floor lounge, Corbett Hall
10:30–11:30	**Jean-Loup Waldspurger**: *Some local preparations for the stabilization of the local twisted trace formula*
11:30–13:30	Lunch
13:00–14:00	Guided Tour of The Banff Centre; meet in the 2nd floor lounge, Corbett Hall
15:00–15:30	Pause café, 2nd floor lounge, Corbett Hall
17:30–19:00	Dinner

Thursday

07:00–09:00	Breakfast
09:00–10:00	**Wen-Wei Li**: *Towards a stable trace formula for metaplectic groups and its applications*
10:00–10:30	Pause Café, 2nd floor lounge, Corbett Hall
10:30–11:30	**Atsushi Ichino**: *Formal degrees and local theta correspondence*
11:30–13:30	Lunch
13:30–14:30	**Tasho Kaletha**: *Simple wild L-packets*
14:30–14:45	Pause Café, 2nd floor lounge, Corbett Hall
14:45–15:45	**Erez Lapid**: *Whittaker-Fourier coefficients for the metaplectic group*
17:30–19:00	Dinner

Friday

07:00–09:00	Breakfast
09:00–10:00	**Mahdi Asgari**: *Counting Cusp Forms on Classical Groups*
10:00–10:15	Pause café, 2nd floor lounge, Corbett Hall
10:15–11:15	**Eric Urban**:
11:30–12:00	**Checkout**
12:00–13:30	Lunch

** 5-day workshops are welcome to use BIRS facilities (2nd Floor Lounge, Max Bell Meeting Rooms, Reading Room) until 3 pm on Friday, although participants are still required to checkout of the guest rooms by 12 noon. **

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ABSTRACTS

Speaker: **James Arthur** (University of Toronto)
Title: *Representations of orthogonal and symplectic groups*
Abstract: Suppose that G is a connected, quasisplit orthogonal or symplectic group over a number field F. I shall review the statements of theorems that classify automorphic representations of G. The proof of these theorems rests on an extended argument that is ultimately based on the comparison of trace formulas, specifically, the stabilization of the trace formula for G, and the conditional stabilization of the twisted trace formula for GL(N). I shall try to give some overview of the proof, insofar as this is feasible in the time available. If possible, I would also like to describe some of the basic implications of the theorems. Finally, I hope to add a few remarks on how the classification would extend to inner forms of G.

Speaker: **Mahdi Asgari** (Oklahoma State University)
Title: *Counting Cusp Forms on Classical Groups*
Abstract: I will discuss some work in progress, joint with Werner Mueller, trying to establish Weyl's law with remainder for classical groups. This extends results of Lapid-Mueller on GL(N) and is an application of the Arthur Trace Formula. Without remainder terms, Weyl's law is now known in a rather general setting thanks to results of Lindenstrauss-Venkatesh, following a great number of earlier results.

Speaker: **Thomas Haines** (University of Maryland)
Title: *Test functions for Shimura varieties with arbitrary level*
Abstract: I will explain a conjecture (joint with Kottwitz) which predicts which test functions are plugged into the twisted orbital integrals at p in the Langlands-Kottwitz expression for the Lefschetz formula of a Shimura variety having arbitrary level at p. This conjecture is phrased in terms of L-parameters, but can be stated unconditionally and proved in several cases, including a $\Gamma_1(p)$-level situation (joint with Rapoport). It also gives rise to a further conjecture on endoscopic transfer of the stable Bernstein center, for which some results are also now available.

Speaker: **Atsushi Ichino** (Kyoto University)
Title: *Formal degrees and local theta correspondence*
Abstract: The formal degree conjecture expresses the formal degree of a discrete series representation of a reductive group over a local field in terms of the adjoint gamma factor of its Langlands parameter. This conjecture is supported by various examples but is still open for classical groups. On the other hand, it is expected that the theta correspondence realizes a functorial lift. We prove the expected behavior of formal degrees under the theta correspondence. If time permits, we also discuss a relation with the Siegel-Weil formula. This is joint work with Wee Teck Gan.

Speaker: **Tasho Kaletha** (IAS)
Title: *Simple wild L-packets*
Abstract: We will review recent explicit constructions of supercuspidal L-packets for general classes of

reductive p-adic groups, focusing in particular on the L-packets which consist of simple supercuspidal representations. Those representations were constructed in a recent paper of Gross and Reeder, in which the authors also define a class of Langlands parameters, called simple wild, and conjecture that these should correspond to the simple supercuspidal representations. Starting from a simple wild parameter, we will show how to construct a finite set of simple supercuspidal representations. Each step of this construction will be explicit and computable. Moreover, we will show that this finite set satisfies many properties expected from an L-packet – it provides a stable character, contains a unique generic representation for a fixed Whittaker datum, and admits a description in terms of the Langlands dual group.

Speaker: **Erez Lapid** (Hebrew University)
Title: *Whittaker-Fourier coefficients for the metaplectic group*
Abstract: The (1st generation) descent method of Ginzburg-Rallis-Soudry provides an explicit realization of the generic element of an L-packet of a classical group in terms of its functorial lift to GL(n). Using it, the (special case of the) Ichino-Ikeda conjecture for Whittaker-Fourier coefficients reduces to a local statement. We study the latter in the case of the metaplectic group Mp_n. This gives a new approach already for the classical case $n = 1$ (proved by Waldspurger around 1980). Joint work with Zhengyu Mao.

Speaker: **Wen-Wei Li** (Institut de Mathématiques de Jussieu)
Title: *Towards a stable trace formula for metaplectic groups and its applications*
Abstract: Due to the recent progress on the stable trace formula, our understanding of the representations of reductive groups has advanced significantly. However, such techniques had not been systematically applied to non-algebraic coverings of connected reductive groups, for example the metaplectic twofold covering for Sp(2n), which appear naturally in number theory. Based on some ideas of Adams, I will discuss some progress in this direction and the consequences.

Speaker: **Paul Mezo** (Carleton University)
Title: *Twisted spectral transfer for real groups*
Abstract: Kottwitz and Shelstad generalized the framework of endoscopy to include twisting by group automorphisms or central characters. This generalization contained conjectural identities between orbital integrals, constituting a transfer from functions on a group to functions on one of its endoscopic groups. This geometric transfer has recently been proven by Shelstad. Dual to geometric transfer is spectral transfer, which is a collection identities between characters of L-packets of a group and one of its endoscopic groups. We show how some work of Bouaziz, Duflo and Shelstad may be adapted to the twisted endoscopy of real reductive groups in order to achieve spectral transfer.

Speaker: **Dipendra Prasad** (Tata Institute of Fundamental Research)
Title: *Relative Local Langlands*
Abstract: The aim of the lecture will be formulate a precise conjecture about which representations of G(K) have G(k) invariant linear form, for G a reductive algebraic group over a local field k with K a quadratic extension of k. A special case (for K = k+k) will give a precise information on the contragredient of a representation of G(k), extending the recipe of [MVW] for classical groups. This is part of a joint work with Ananadavardhanan.

Speaker: **Gordan Savin** (Utah)
Title: *Functoriality via matching of Hecke algebras*
Abstract: Let G and G' be two split reductive groups acting on a minimal representation (r, V) as a dual pair. Let H and H' be the Hecke algebras corresponding to hyperspecial compact subgroups K and K' of G and G' respectively. Assume that there should be a functorial transfer of representations from G to G' which, for unramified representations, is given by a natural homomorphism f from H' to H. In this lecture I will explain how to prove (in many cases) that $r(T) = r(T')$ on the subspace of $K \times K'$ fixed vectors in V for every T' in H' and $T = f(T')$. This is a joint work with Mike Woodbury.

Speaker: **Diana Shelstad** (Rutgers)

Title: *Some results in endoscopic transfer*

Abstract: We follow the theme of stabilization, and start with Arthur's paradigm for the invariant trace formula, *geometric side = spectral side*, in the case $G = SL(2)$ over a number field. A simple canonical sign, an adelic transfer factor, provides a measure of instability in the invariant trace formula from the geometric side. If we write a good product formula, over all places, for the factor then we can find another simple canonical sign, an adelic spectral transfer factor, giving a *spectral* interpretation of instability. This offers some motivation for a more recent look at endoscopy, twisted or not, for general connected, reductive G defined over $\mathbb{R}$, for extended groups (K-groups) even. Internal motivation is that a structure for tempered spectral factors comes *almost* for free once the geometric transfer factors have been defined. We will discuss some of the theorems and describe tools used in their proof that may be helpful as well for an approach to some questions at the infinite places in Langlands' program for stable transfer (or *stable-stable* transfer for emphasis that it lies beyond endoscopy). We also discuss results, some only partial, useful in Arthur's endoscopic classification for classical groups.

Speaker: **Eric Urban** (Columbia University)

Speaker: **Jean-Loup Waldspurger** (Institut de Mathématiques de Jussieu)

Title: *Some local preparations for the stabilization of the local twisted trace formula*