p-adic groups and representations in the Langlands program
Groupes p-adiques et représentations dans le programme de Langlands
(Org: **Clifton Cunnigham** (University of Calgary) and/et **Monica Nevins** (University of Ottawa))

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KRISTAPS BALODIS, University of Calgary
p-adic analogs of the Kazhdan-Lusztig hypothesis

The Kazhdan-Lusztig hypothesis was originally formulated for complex groups, and then real groups. The proofs of these conjectures culminated in the ATLAS project. Among other things, this first allowed mathematicians to "get a grip" on the mysterious $E8$ group. Since then, various attempts at formulating and proving a p-adic analog have been made, beginning with the work of Zelevinsky in the case of $GL(n)$. Our primary goal will be to state a slight modification of the conjecture due to Vogan, the necessity of which was pointed out, though not corrected in a recent pre-print of Solleveld. We will also make comparisons to the famous *Theorem 8.6.23* of Chriss and Ginzburg, which is often cited as being 'the' p-adic analog of Kazhdan-Lusztig hypothesis.

ADÈLE BOURGEOIS, Tutte Institute for Mathematics and Computing
Functoriality of Supercuspidal L-packets

The Local Langlands Correspondence requires L-packets to satisfy a fundamental functorial property. Borel phrases this property entirely in terms of the representations inside the L-packets. Solleveld presents a more precise form of this conjecture involving characters on a dual group.

In this talk, we restrict our attention to L-packets for supercuspidal L-parameters of tame p-adic groups. Such packets were constructed by Kaletha and consist entirely of supercuspidal representations, for which we have explicit descriptions. We show that Kaletha's L-packets satisfy this wanted functorial property. Furthermore, we show that Solleveld's conjecture holds for quasisplit groups when the L-packets come from supercuspidal L-parameters which are regular.

JOSÉ CRUZ, University of Calgary
Vogan's perspective on the local Langlands Correspondence, the Fourier Transform and the Function Sheaf Dictionary

Let F be a p-adic group, and let G be a connected reductive algebraic group over F. The local Langlands correspondence for G predicts the existence of a partition of the set of equivalence classes of irreducible representations of $G(F)$, into certain finite sets called L-packets, which in turn correspond to equivalence classes of Langlands parameters. Vogan's perspective on the local Langlands correspondence gives a bijection between smooth irreducible representations sharing an infinitesimal parameter and irreducible perverse sheaves on certain moduli space of Langlands parameters.

The main idea of this talk is to show, in the case of SO_5, how we can use the function-sheaf dictionary to compute the Fourier transforms of some of the simple perverse sheaves appearing in the correspondence. One of the main reasons we are interested in these computations is that the Fourier transform on the geometric side seems to correspond to Aubert's involution on the spectral side!

SARAH DIJOLS, U of Calgary
Recent progress on the search for representations of G_2 distinguished by SO_4

Joint work with Nadir Matringe.

I will explain how Mackey's theory for p-adic groups allows us to identify this type of representations, and a new approach, in progress, where we use the structure of the p-adic octonions and their quaternionic subalgebras to describe the double coset space $P\backslash G_2/SO_4$.

MELISSA EMORY, Oklahoma State University
Beyond Endoscopy via Poisson Summation

Langlands proposed a strategy called Beyond Endoscopy to prove the principle of functoriality, which is one of the central questions of present day mathematics. A first step was achieved by Ali Altug who worked with the group $GL(2)$ over the rationals. This project generalizes Altug's result to a number field. In this talk we will emphasize some interesting differences between our work and Altug's work. This is joint work with Malors Espinosa-Lara, Debanjana Kundu and Tian An Wong.

JU-LEE KIM, MIT

KAROL KOZIOL, CUNY Baruch College
Derived K-invariants and the derived Satake transform

The classical Satake transform gives an isomorphism between the complex spherical Hecke algebra of a p-adic reductive group G, and the Weyl-invariants of the complex spherical Hecke algebra of a maximal torus of G. This provides a way for understanding the K-invariant vectors in smooth irreducible complex representations of G (where K is a maximal compact subgroup of G), and allows one to construct instances of unramified Langlands correspondences. In this talk, I'll present work in progress with Cédric Pépin in which we attempt to understand the analogous situation with mod p coefficients, and working at the level of the derived category of smooth G-representations.

FIONA MURNAGHAN, University of Toronto
Relatively supercuspidal representations

Let (G, H) be a p-adic symmetric pair. (That is, G is a connected reductive p-adic group and H is the group of fixed points of an involution of G that is defined over the field of definition of G.) The H-relatively supercuspidal representations of G are the H-distinguished representations of G having the additional property that their generalized matrix coefficients are compactly supported modulo $H \cdot Z(G)$, where $Z(G)$ is the centre of G. We will discuss a procedure for constructing H-relatively supercuspidal representations. In addition, we will give information about H-relatively supercuspidal representations whose inertial supports are comprised of regular supercuspidal representations ("regular" in the sense of Kaletha).

THOMAS RÜD, MIT
Stable trace formula, orbital integrals, and Tamagawa numbers

Motivated by both the stable trace formula but also recent advances in the computation of explicit mass formulae for Shimura varieties, I will talk about explicit computations of Tamagawa numbers for maximal tori in symplectic groups as well as a descent problem related to orbital integrals.

JAMES STEELE, University of Calgary
Koszul duality patterns in the p-adic local Langlands correspondence

The p-adic local Langlands correspondence currently posits a relationship between sets of irreducible representations of **Rep**(G), the category of smooth representations of a connected, reductive, p-adic group G, with sets of so-called Langlands parameters. In this talk, we show that the correspondence can be lifted to a Koszul duality between certain full subcategories of **Rep**(G)

and categories resulting from a geometerisation of Langlands parameters and describe the Koszul duality between these pairs of Abelian categories, explaining how many characteristics of the local Langlands program can be formalised through this perspective.

E THOMPSON, University of Calgary

A Geometric Algorithm for Computing Zelevinsky Standard Representations.

The p-adic Khazdhan Lusztig Hypothesis (pKLH) can be described as a relation between multiplicities of representation theoretic objects and dimensions of algebro-geometric objects. Explicitly, the pKLH translates between the Grothendieck group change of basis matrix—which sends Zelevinsky standard representations to irreducible representations—and the stalk table for certain intersection cohomology complexes on a moduli space of Langlands parameters. This relation allows for the structure of Zelevinsky standard representations to be parsed using algebro-geometric tools applied to the well-studied moduli spaces of Langlands parameters known as Vogan varieties. In this talk I will sketch an algorithm for computing the stalks of intersection cohomology complexes attached to trivial local systems which are supported on orbit closures in a given Vogan variety. Currently the algorithm is restricted to the case of $\mathrm{GL}_n(F)$ due to the simple perverse sheaves in this case being characterized by these intersection cohomology complexes for trivial local systems. Nonetheless, this algorithm has shown success for certain infinite families of Vogan varieties, which are classified by appropriate infinitesimal parameters. Once computed, the stalks of the intersection cohomology complexes can be translated back into the decompositions of Zelevinsky standard representations in terms of irreducible representations, assuming the pKLH. Throughout the talk I will provide select examples to elucidate the primary ideas and methods used in the algorithm.