

**2014 ATKIN MEMORIAL LECTURE AND
WORKSHOP: ABSTRACTS OF TALKS**

MAY 2–4, UIC

1. “Selmer groups as flat cohomology groups” by Kestutis Cesnavicius (MIT).

2. “Modular elliptic curves and p -adic L -functions” by David Hansen (Jussieu)

Abstract: I’ll explain an optimally general construction of p -adic L -functions associated with modular elliptic curves over an arbitrary number field.

3. “ L -invariants of symmetric powers of modular forms” by Robert Harron (Madison).

Abstract: A fruitful way to study the arithmetic significance of special values of L -functions is via their interpolation by p -adic L -functions. In this talk, I will discuss the phenomenon of L -invariants, which arise when the interpolation property provides no immediate information. Specifically, the value of the p -adic L -function may vanish even when the value of the original L -function does not. Beginning with the work of MazurTateTeitelbaum on a p -adic BirchSwinnerton-Dyer conjecture, it has been conjectured that the value of the derivative of the p -adic L -function should relate to the original L -value, up to the introduction of a new factor: the L -invariant. I will a bit of an overview of the subject and what is known before discussing joint work with Andrei Jorza where we obtain formulas for the L -invariants of symmetric powers of modular forms.

4. “Automorphic cycles and p -adic L -functions on families of Hilbert modular forms” by Andrei Jorza (Notre Dame).

Abstract: In certain cases p -adic L -functions, which interpolate p -adically special values of L -functions, vanish even if the complex L -function doesn't vanish. In such cases the Mazur-Tate-Teitelbaum conjecture and its generalizations compute the derivative of the p -adic L -function in terms of an arithmetically defined quantity called the p -adic L -invariant. A crucial component for the study of these conjectures is the availability of so-called two variable p -adic L -functions in families of automorphic forms. In joint work with D. Barrera and M. Dimitrov we construct such two variable p -adic L -functions for finite slope Hilbert modular forms using integration against certain automorphic cycles and we prove a Mazur-Tate-Teitelbaum conjecture when the Hilbert modular form is special at p .

5. "Degeneration of regulators and height pairings" by Kazuya Kato (Chicago).

Abstract: In Beilinson conjectures, regulators and height pairings are important for the arithmetic studies of L -functions. In the joint works with Usui and Nakayama, I studied degeneration of Hodge structures. The study, which has been complex analytic, is getting arithmetic now. I hope to talk about applications to arithmetic. I am collaborating with Spencer Bloch on this subject.

6. "Universal torus period and p -adic Waldspurger formula" by Yifeng Liu (MIT).

Abstract: This talk will be a more detailed account about the p -adic Waldspurger formula appeared in the talk of Shouwu Zhang, which is a joint work with him and Wei Zhang. We will discuss how to construct the universal torus period using the infinite Igusa tower and the formal Lubin-Tate action, from which we arrive at the construction of our p -adic anticyclotomic L -function. The arithmetic nature of certain special values of this p -adic L -function will also be explained.

7. "Anticyclotomic main conjectures and elliptic curves of rank at most one." by Christopher Skinner (Princeton).

8. “The p -adic L -function of critical slope Eisenstein series” by Ander Steele (Calgary).

Abstract: Let f be an eigenform on $\Gamma_1(N) \cap \Gamma_0(p)$. If f is non-critical then the work of Amice and Velu provides us with a p -adic L -function $L_p(f, s)$ interpolating the critical values of f . Thanks to the work of Pollack-Stevens and Bellaïche we now have a natural notion of $L_p(f, s)$ even when f has critical slope. In this talk we show how to use the Shintani modular symbol, which parameterizes the special values of L -functions of real quadratic fields, to compute $L_p(f, s)$ when f is a critical slope (or “evil twin”) Eisenstein series. Our main result is a factorization formula for $L_p(f, s)$, similar to a formula for its ordinary twin, which was recently proved by Bellaïche and Dasgupta using different techniques.

9. Atkin Memorial Lecture “The congruent number problem and L -functions” by Shou-Wu Zhang (Princeton)

Abstract: A thousand years old problem is to determine which positive integers are congruent numbers, i.e, those numbers which could be the areas of right angled triangles with sides of rational lengths. This problem has some beautiful connections with elliptic curves and L -functions. In fact by the Birch and Swinnerton-Dyer conjecture, all $n \equiv 5, 6, 7 \pmod{8}$ should be congruent numbers, and most of $n \equiv 1, 2, 3 \pmod{8}$ should not be congruent numbers. In this lecture, I will explain these connections and then some recent progress based on the Waldspurger formula and the Gross–Zagier formula.

10. “A p -adic Waldspurger formula” by Shou-Wu Zhang (Princeton)

Abstract: In this talk, I will explain a p -adic Waldspurger formula proved by Bertolini–Darmon–Prasanna under the Heegner condition, and in full generality later by Liu–Zhang–Zhang. I will start with a classical Waldspurger formula on complex modular forms and a Gross–Zagier formula on rational modular forms, then define p -adic modular forms, p -adic L -functions, p -adic period integrals, and finally state a p -adic Waldspurger formula.

11. “Selmer groups and the divisibility of Heegner points” by Wei Zhang (Columbia).

Abstract: This talk is about a proof of Kolyvagin’s conjecture in 1991 on p -indivisibility of (derived) Heegner points for ordinary primes $p > 3$ with some ramification conditions, with some application to the arithmetic of elliptic curves.