SOUTHERN CALIFORNIA NUMBER THEORY DAY, OCTOBER 21, 2017

ABSTRACTS

Werner Bley, *On the square root of the inverse different*

Let L/K be an odd degree Galois extension of number fields and set $G :=$ Gal(L/K). Let $A_{L/K}$ denote the square root of the inverse different. By a result of Erez, $A_{L/K}$ is projective as a $\mathbb{Z}[G]$-module if and only if L/K is at most weakly ramified, i.e., for each ramified prime the second ramification subgroup (in lower numbering) is trivial.

For such a weakly ramified odd degree Galois extension we define and study a canonical invariant in the relative algebraic K-group $K_0(\mathbb{Z}[G], \mathbb{Q}[G])$ which projects to the class of $A_{L/K}$ in $K_0(\mathbb{Z}[G])$. Our results shed new light on a conjecture of Vinatier which predicts that $A_{L/K}$ is always a free $\mathbb{Z}[G]$-module.

This is joint work with David Burns and Carl Hahn.

Wei Ho, *Odd degree number fields with odd class number*

For any fixed odd integer $n \geq 3$, we study the 2-torsion of the ideal class groups of certain families of degree n number fields. We show that (up to a tail estimate) the average size of the 2-torsion in these families matches the predictions given by the Cohen-Lenstra-Martinet-Malle heuristics, which predict the distribution of class groups of number fields. As a consequence, we find that for any odd $n \geq 3$, there exist infinitely many number fields of degree n and associated Galois group S_n whose class number is odd. This talk is based on joint work with Arul Shankar and Ila Varma.

Preston Wake, *The rank of Mazur's Eisenstein ideal*

In his landmark 1976 paper "Modular curves and the Eisenstein ideal", Mazur studied congruences modulo p between cusp forms and an Eisenstein series of weight 2 and prime level N. We use deformation theory of pseudorepresentations to study the corresponding Hecke algebra. We will discuss how this method can be used to refine Mazur's results, quantifying the number of Eisenstein congruences. Time permitting, we'll also discuss some partial results in the composite-level case. This is joint work with Carl Wang-Erickson.

David Zureick-Brown, *Progress on Mazur's program B*

I'll discuss recent progress on Mazur's "Program B"–the problem of classifying all possibilities for the "image of Galois" for an elliptic curve over $\mathbb{Q}$ (equivalently, classification of all rational points on certain modular curves X_H).