

NUMBER THEORY DAY

National University of Singapore
September 11 (Wednesday), 2013

(Venue: SR1, Level 4, Block 17)

Morning Session

9:30-10:30am

Speaker: Chieh-Yu Chang (National Tsing Hua University, Taiwan)
Title: **On Hilbert's seventh problem and transcendence theory II**

10:30-11:00am Tea break

11:00-12:00noon

Speaker: Chen-bo Zhu (NUS)
Title: **Conservation relations for local theta correspondence**

Afternoon Session

2:30-3:30pm Departmental Colloquium
Speaker: Zeev Rudnick (Tel Aviv University, Israel)
Title: **Primes, polynomials over finite fields, and the classical Lie groups**

3:30-4:00pm Tea break

4:00-5:00pm

Speaker: Atsushi Ichino (Kyoto University, Japan)
Title: **Periods of automorphic forms: the case of $(GL_{n+1} \times GL_n, GL_n)$**

Contact: Wee Teck Gan (matgwt@nus.edu.sg) or Chen-bo Zhu (matzhucb@nus.edu.sg)

Abstract of the talks

1. On Hilbert's seventh problem and transcendence theory II

(Chieh-Yu Chang)

Hilbert's seventh problem is about the linear independence question of two logarithms of algebraic numbers, which was solved by Gelfond and Schneider in the 1930s. Later on, it was generalized to several logarithms of algebraic numbers by Baker in the 1960s and generalized to general abelian logarithms of algebraic points by Wuestholz in the 1980s. However, algebraic independence question is still wide open. In the first talk (Tuesday 10am, Sept 10, 2013), we will give a survey on the classical theory and report recent progress on the parallel algebraic independence question for function fields in positive characteristic. Key ingredients of the tools using t-motives will be discussed in the second talk.

2. Conservation relations for local theta correspondence

(Chen-bo Zhu)

Kudla and Rallis, in the mid 1990's, conjectured certain conservation relations on the first occurrence indices of a smooth representation in the context of local theta correspondence. The conjectured statement is one of the three fundamental principles in the theory (the other two being the Howe duality conjecture and the multiplicity one conjecture). I will explain this conservation conjecture and the idea of its proof (for all type I irreducible dual pairs and all local fields of characteristic zero). This is joint work with Binyong Sun.

3. Primes, polynomials over finite fields, and the classical Lie groups

(Zeev Rudnick)

The subject of the talk is the inter-relationship between the arithmetic of the integers and that of the ring of polynomials over a finite field. While several problems, such as the Riemann Hypothesis, take the same form in both theories, in some aspects the situation over finite fields is simpler and there are powerful techniques due to Weil, Grothendieck, Deligne and Katz which do not have known parallels over the integers. We have recently been able to use results over finite fields to make predictions for several classical problems in analytic number theory as well as to establish new results. New links are established with statistics of random permutations and of random matrices in the classical compact Lie groups. The lecture will give an overview of these matters, and is intended for a general audience.

4. Periods of automorphic forms: the case of $(GL_{n+1} \times GL_n, GL_n)$

(Atsushi Ichino)

Following Jacquet, Lapid and Rogawski, we define a regularized period of an automorphic form on $GL_{n+1} \times GL_n$ relative to GL_n , and we express it in terms of the zeta integral studied by Jacquet, Piatetski-Shapiro and Shalika. This extends the theory of the Rankin-Selberg integral representation for $GL_{n+1} \times GL_n$ to all automorphic forms on $GL_{n+1} \times GL_n$. The proof uses an idea of Lapid and Rogawski. This is a joint work with Shunsuke Yamana.