

# 2014 早稲田整数論研究集会アブストラクト

日時： 2014 年 3 月 11 日 (火) ~ 13 日 (木)

会場： 早稲田大学 理工学部 (西早稲田 (大久保) キャンパス)  
55 号館 N 棟 1 階 第二会議室

3 月 11 日 (火)

10:00–10:45 大竹 秀一 (早稲田大学) / Shuichi Ohtake (Waseda University)

**Title:** Orthogonal decompositions of integral trace forms of cyclotomic fields

**Abstract:** Trace form is the symmetric  $F$ -bilinear form on  $K := F[x]/(f(x))$  defined by  $(x, y) \rightarrow \text{trace}_{K/F}(xy)$ , where  $f(x)$  is a separable polynomial over the field  $F$  of characteristic different from two. If  $f(x)$  is an irreducible polynomial over the field of rational numbers  $\mathbb{Q}$ , then the restriction of the trace form to the ring of integers  $O_K$  of the number field  $K$  defines a symmetric bilinear form over the ring of rational integers  $\mathbb{Z}$  on  $O_K$  - called the integral trace form of  $K$ . In this talk, we give orthogonal decompositions of integral trace forms of cyclotomic fields and their canonical forms over the ring of  $p$ -adic integers explicitly by using Bezoutian forms.

11:05–11:50 藤井 俊 (金沢工業大学) / Satoshi Fujii (Kanazawa Institute of Technology)

**Title:** On Greenberg's conjecture for CM-fields

**Abstract:** Let  $k/\mathbb{Q}$  be a finite extension and  $p$  an odd prime number. Let  $K/k$  be the maximal multiple  $\mathbb{Z}_p$ -extension, and let  $\text{Gal}(K/k) \simeq \mathbb{Z}_p^d$ . Let  $L/K$  be the maximal unramified abelian pro- $p$  extension and  $X$  its Galois group. By a fundamental fact of Iwasawa theory,  $X$  is a module over the formal power series ring  $\Lambda$  with coefficients in  $\mathbb{Z}_p$  of  $d$ -variables. Then Greenberg conjectured that  $X$  is pseudo-null over  $\Lambda$ . In this talk, we show that Greenberg's conjecture holds under the following four conditions:

- 1)  $k$  is a CM-field such that  $p$  splits completely.
- 2) Leopoldt's conjecture holds for  $k$  and  $p$  (e.g.  $k$  is imaginary abelian).
- 3)  $p$  does not divide the class number of  $k$ ,
- 4)  $\lambda_p(k^+) = \mu_p(k^+) = \nu_p(k^+) = 0$ , where  $\lambda, \mu$  and  $\nu$  denote Iwasawa invariants and  $k^+$  denotes the maximal totally real subfield of  $k$ .

14:00–14:45 尾崎 学 (早稲田大学) / Manabu Ozaki (Waseda University)

**Title:** The Neukirch-Uchida theorem for a certain class of number fields of infinite degree

**Abstract:** I will give a Neukirch-Uchida type theorem (that is, the isomorphism class of a field is determined from its absolute Galois group) for a certain class of number fields of infinite degree.

15:05–15:50 星 裕一郎 (京都大学) / Yuichiro Hoshi (Kyoto University)

**Title:** Reconstruction of a Number Field From the Absolute Galois Group

**Abstract:** It follows from the Neukirch-Uchida Theorem that the isomorphism class of a number field is completely determined by the isomorphism class of the associated absolute Galois group. On the other hand, the Neukirch-Uchida Theorem (as well as its proof) does not give a "functorial group-theoretic algorithm" for reconstructing the original number field from the absolute Galois group. In this talk, I discuss such a "functorial group-theoretic algorithm".

- 16:10–16:55 佐久川 憲児 (大阪大学) / Kenji Sakugawa (Osaka University)  
**Title:** A control theorem for the torsion Selmer pointed set  
**Abstract:** Selmer groups are important arithmetic invariants of Galois representations. Minhyong Kim defined the Selmer variety which is a non-abelian analogue of the  $\mathbb{Q}_p$ -Selmer group. In this talk, we give a torsion analogue of the Selmer variety. Then, we establish an analogue of Mazur’s control theorem for this torsion analogue.
- 17:15–18:00 中村 健太郎 (北海道大学) / Kentaro Nakamura (Hokkaido University)  
**Title:** Local  $\varepsilon$ -isomorphisms for rank two  $p$ -adic representations of  $\mathrm{Gal}(\overline{\mathbb{Q}_p}/\mathbb{Q}_p)$  and a functional equation of Kato’s Euler system  
**Abstract:** Local  $\varepsilon$ -isomorphisms are conjectural bases of the determinants of the Galois cohomologies of  $p$ -adic representations of  $\mathrm{Gal}(\overline{\mathbb{Q}_p}/\mathbb{Q}_p)$  which  $p$ -adically interpolate local constants ( $\varepsilon$ -constants,  $L$ -constants, etc.) associated to de Rham representations. Up to now, such bases have been constructed for rank one case by Kazuya Kato, crystalline case by Benois-Berger, Loeffler-Zerbes-Venjakob, and trianguline case by the speaker. In this talk, using Colmez’s theory of  $p$ -adic Langlands correspondence for  $\mathrm{GL}_2(\mathbb{Q}_p)$ , we define such bases for (almost) all rank two torsion  $p$ -adic representations. We show that our  $\varepsilon$ -isomorphisms satisfy the desired interpolation property in many important cases. As an application, we prove a functional equation of Kato’s Euler systems associated to modular forms without any condition at  $p$ . Under the assumption that Kato’s Euler systems give the zeta isomorphisms, this functional equation implies Kato’s global  $\varepsilon$ -conjecture.
- 3 月 12 日 (水)
- 10:00–10:45 都築 正男 (上智大学) / Masao Tsuduki (Sophia University)  
**Title:** Equidistribution and subconvexity bound related to certain  $L$ -values.  
**Abstract:** This is joint work with Singo Sugiyama (Osaka Univ.).  
I would like to report our recent refinement on a spectral equidistribution result in the level aspect for Satake parameters of holomorphic Hilbert cusp forms weighted by central  $L$ -values, and a bound of quadratic base change  $L$ -functions for Hilbert cusp forms with a subconvex exponent in the weight aspect.
- 11:05–11:50 青木 宏樹 (東京理科大) / Hiroki Aoki (Tokyo University of Science)  
**Title:** Determination of the structure of vector valued Siegel modular forms by using Jacobi forms  
**Abstract:** In general, the determination of the structure of modular forms is difficult, although the dimension formula is well known. However, sometimes by using Jacobi forms or Witt operators, we can easily determine the structure of some kinds of modular forms. In this talk, I shall introduce this strategy and show some examples, including the structure theorem of vector valued Siegel modular forms of level 2.

- 14:00–14:45 Thomas Wieber (Heidelberg University)  
**Title:** Geometrically proven structure theorems for vector valued Siegel modular forms  
**Abstract:** I shall begin with classical results on vector valued (cuspidal) Siegel modular forms. Afterwards, I shall present new structure theorems for vector valued Siegel modular forms with respect to  $\mathrm{Sym}^2$  and Igusa's subgroup  $\Gamma_2[2, 4]$ . They rest on the well known fact that  $\Gamma$ -invariant tensor fields on the Siegel upper halfplane can be viewed as vector valued Siegel modular forms with respect to this group  $\Gamma$ . For our group the Satake compactification is the 3-dimensional projective space. After observing the tensors on the Satake compactification the structure theorem(s) and Hilbert function(s) for the representation  $\mathrm{Sym}^2$  become rather evident. Here, we discovered a new strategy to retrieve structure theorems for other appropriate groups. Examples executed by Freitag, Salvati Manni and partially the speaker include the groups of genus two  $\Gamma_2[4, 8]$  and  $\Gamma_2[2, 4, 8]$  and even one of Igusa's subgroups of genus 3  $\Gamma_3[2, 4]$ . Using invariant theory we could reprove Aoki's structure theorem for  $\Gamma_{2,0}[2]$  and Clery's, van der Geer's and Grushevsky's structure theorem for  $\Gamma_2[2]$  and  $\mathrm{Sym}^2$ .
- 15:05–15:50 伊吹山 知義 (大阪大学) / Tomoyoshi Ibukiyama (Osaka University)  
**Title:** Construction of liftings to vector valued Siegel modular forms  
**Abstract:** Using the Hayashida-Maass relation of Ikeda lift and good differential operators, we construct several liftings to vector valued Siegel modular forms of integral or half-integral weight from a pair of elliptic modular forms.
- 16:10–16:55 足立 恒雄 氏 (早稲田大学) / Norio Adachi (Waseda University)  
**Title:** 'sacred' or 'profane' ?  
**Abstract:** What is mathematics? We present the following tentative answer for discussion. Mathematics takes a syntactical and a semantical form; the syntactical form is usually called pure mathematics, the semantical form applied mathematics.
- 18:00–20:00 Workshop Party
- 3月13日(木)
- 9:30–10:15 坂田 実加 (近畿大学) / Mika Sakata (Kinki University)  
**Title:**  $p$ -order of poly-Bernoulli numbers  
**Abstract:** Poly-Bernoulli numbers were introduced and studied by M.Kaneko as a generalization of classical Bernoulli numbers. He clarified the  $p$ -divisibility of denominators of di-Bernoulli numbers. On the other hand, poly-Bernoulli numbers of negative index have combinatorial interpretation. In this talk, we plan to discuss their  $p$ -divisibility and periodicity.
- 10:35–11:20 広瀬 稔 (京都大学) / Minoru Hirose (Kyoto University)  
**Title:** On the theory of fans and its application to Shintani  $L$ -function and Hecke  $L$ -function  
**Abstract:** Shintani  $L$ -function is a holomorphic function of several variables defined by a certain Dirichlet series. A fan is a formal sum of cone regions. I explain about the theory of fans and its application to Shintani  $L$ -function and Hecke  $L$ -function.

11:40–12:25 兵藤 史武（早稲田大学） / Fumitake Hyodo (Waseda University)  
**Title:** A formal power series of a Hecke ring associated with the Heisenberg Lie algebra  
**Abstract:** This talk studies a formal power series with coefficients in a Hecke ring associated with the Heisenberg Lie algebra. We relate the series to the classical Hecke series defined by E. Hecke, and prove that the series has a property similar to the rationality theorem of the classical Hecke series. And then, our results recover the rationality theorem of the classical Hecke series.

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