

## Preface

Mathematics is a part of our culture. As such, the works presented here serve the purposes of developing branches involved, popularizing existing theories, and guiding our future explorations.

Accordingly, the collection of this volume may be roughly divided into three categories. More precisely, first, Jiang's paper deals with local gamma factors that appeared in the theory of automorphic representations; Obitsu-To-Weng's paper investigates the intrinsic relations between Weil-Petersson and Takhtajan-Zograf metrics on moduli spaces of punctured Riemann surfaces using Deligne pairings and an arithmetic Riemann-Roch isometry; Werner's paper explains her recent works with Deninger on vector bundles on curves over  $\mathbb{C}_p$ ; Yoshida's paper exposes his beautiful theory on CM periods; and Yu's paper studies the transcendence of special values for zetas over finite fields. All these well-prepared articles then bring us to the uppermost frontiers of the current researches in Arithmetic Geometry and Number Theory. Secondly, the lecture notes of Weng explains basic ideas and methods behind the fundamental yet famously difficult work of Langlands on the Eisenstein series and spectral decompositions. The reader will find these notes invaluable in understanding the original theory. Finally, Weng's paper of Geometric Arithmetic outlines a Program for understanding global arithmetic using algebraic and/or analytic methods based on geometric considerations – the topics touched here are a continuation of Weil's approach on non-abelian Class Field Theory using stability and Tannakian category theory; new yet genuine non-abelian zetas and  $L$ s which are closely related with the so-called Arthur's periods; and an intersection approach to the Riemann Hypothesis.

While various important topics are selected, all papers share common themes such as the Eisenstein series, stability and zeta functions.

Jiang's paper was presented at the Conference on  $L$ -Functions (February 18-23, 2006, Fukuoka). Partial contents of the papers of

Obitsu-To-Weng, Werner, Yoshida and Yu were delivered by W.-K. To, A. Werner, H. Yoshida and J. Yu, respectively, in the (series of) lectures at our Karatsu symposium on ‘Arithmetic Geometry and Number Theory’, held from March 21 to March 25, 2005, immediately after the huge Fukuoka earthquake of scale M7.0 (on March 20). The notes about Langlands’ work is based on six lectures of Weng at the Mathematics Department, University of Toronto, between October and November, 2005. Finally, the Program paper, of which the first version was circulated around the turn of the millennium, is revised significantly for this publication and is indeed the driving force for the whole project<sup>1</sup>.

The Editors

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<sup>1</sup>This project is partially supported by JSPS.