

Project No.:18005 Core Institution in Japan: Hiroshima University

JSPS Core-to-Core Program -Strategic Research Networks-
FY2009 Research Report

Project No.	18005
Research Theme	New Developments of Arithmetic Geometry, Motive, Galois Theory, and Their Practical Applications
Duration of Project	from April 1, 2008 to March 31, 2011
Core Institution in Japan	Hiroshima University

Implementing Organizations

Country	Japan
Core Institution	Hiroshima University
Co-Chair (name and title)	Makoto Matsumoto: Professor
Number of Cooperating Institutions	4
Cooperating Institutions	University of Tokyo, Kyoto University, Nagoya University, Tohoku University

Country	United States of America
Core Institution	Duke University
Co-Chair (name and title)	Richard Hain: Professor
Number of Cooperating Institutions	0
Cooperating Institutions	None
Matching Fund	National Science Foundation (United States) Topology and Algebra and Number Theory, the Division of Mathematical Sciences of the NSF: DMS-0706955

Country	Italy
Core Institution	University of Padova
Co-Chair (name and title)	Bruno Chiarellotto: Professor
Number of Cooperating Institutions	0
Cooperating Institutions	None
Matching Fund	University of Padova Progetti di Ricerca Ateneo: Project title: "Rappresentazioni e Motivi": CPDA078279/07

Country	France
Core Institution	University of Paris XI Orsay (Universite de Paris-Sud)
Co-Chair (name and title)	Jean-Marc Fontaine: Professor
Number of Cooperating Institutions	3
Cooperating Institutions	University of Rennes, ENS, University of Paris XIII
Matching Fund	Agence Nationale de la Recherche "REP GAL AUT": ANR - BLAN-06-1-138449

Country	Canada
Core Institution	University of Montreal
Co-Chair (name and title)	Pierre L'Ecuyer: Professor
Number of Cooperating Institutions	0
Cooperating Institutions	None
Matching Fund	Natural Sciences and Engineering Research Council of Canada: Discovery Grants (Individual, Group and Subatomic Physics [SAP] Project): ODGP110050
	Canadian Government: via Prof. L'Ecuyer's Canada Research Chair on "stochastic simulation and optimization"

Result of Program Implementation

Scientific Results:

Pure Mathematics:

R. Hain at Duke Univ. and M. Matsumoto at Hiroshima Univ. obtained results on the relative completion of the fundamental group of the moduli space of elliptic curves, and are writing a paper. They are also writing a paper on Variation of Mixed Hodge Structure with Terasoma and Pearlstein. M. Matsumoto compared the outer Galois action and the aut Galois representation, using Hain-Reed's result on the cohomology of the mapping class group. R. Hain proved a version of Grothendieck's section conjecture for moduli space of curves. These results were reported at several international conferences.

Bruno Chiarellotto at Padova and Nobuo Tsuzuki at Tohoku Univ. wrote a joint paper titled "Log-growth filtration and Frobenius slope filtration of F-isocrystals at the generic and special points", and is to appear in Documenta Math.

A. Cadore at Bordeaux University and A. Tamagawa at Kyoto University obtained a uniform open image theorem for a certain class of l-adic Galois representations, and wrote several joint works, one of which is accepted.

S. Saito at University of Tokyo and M. Kerz at Universitaet Duisburg-Essen proved Kato's conjecture on Higher class field for a large class of schemes.

Pragmatic results:

S. Harase, M. Matsumoto and M. Saito at Hiroshima University produced an algorithm to compute the dimension of equidistribution of pseudorandom number generators, which is more than 10 times faster than existing method. This joint work is to appear in Mathematics of Computation.

M. Saito designed efficient random number generators for

(1) CPUs with SIMD-instruction set (SFMT)

(2) General-Purpose computation on Graphic Processors (MTGP).

Result (1) is published in the proceedings of MCQMC2008, and Result (2) was reported at a conference. Both codes are available from:

<http://www.math.sci.hiroshima-u.ac.jp/~m-mat/MT/>

Achievements in FY2009 (Self Review)

Five international conferences in Japan and four international conferences in France were organized jointly with other academic funds.
For example, 6 young researchers, such as assistant professors and doctor course students, were sent to "Conference in honour of Jean-Marc Fontaine."
More than 100 papers related to this program has been written in this academic year. Some of the research results are written in the above "Result of Program Implementation."

Future Plan (Measures toward Achieving Research Objectives)

Although the project is successfully developing, a problem occurred: M. Matsumoto, the coordinator of Japan-side, moved from Hiroshima University to University of Tokyo on April 1st, 2010. Hiroshima University will continue the development of the international research relationships with domestic/foreign core institutes and collaborating institutes. However, the usage of the budget is limited to construce research cores centered at Hiroshima, Duke, Paris 11th, Montreal, which seems difficult when the coordinator moved.

Thus, although the research network will be developed by using other budget, we decided to withdraw the support from JSPS for the last year of the five years, namely, for 2010.