Working Workshop on  
Calabi-Yau Varieties and Related Topics  
Aug.9 (Thu.),10 (Fri.), 2018  
Rm.301, South Build. #1, Gakushuin University  

Aug.9 (Thu.)
14:30–15:30 Kenji Hashimoto (Univ. of Tokyo)  
Mirror symmetry for complete intersection K3 surfaces in weighted projective spaces  
15:50–16:50 Atsushi Kanazawa (Kyoto Univ.)  
Tyurin degenerations and Lagrangian fibrations of Calabi-Yau manifolds  
17:10 – 18:10 Hisanori Ohashi (Tokyo Univ. of Sci.)  
Topological classification of automorphisms on Enriques surfaces of order 4  
18:30 – Dinner (discussion)  

Aug.10 (Fri.)
9:30–10:30 Shigeyuki Kondo (Nagoya Univ.)  
Borcherds products and K3 surfaces  
11:00 – 12:00 Kenichiro Kimura (Tsukuba Univ.)  
The Abel-Jacobi map for higher Chow cycles  
13:30 – 14:30 Ichiro Shimada (Hiroshima Univ.)  
The elliptic modular surface of level 4 and its reduction modulo 3  
15:00 – 16:00 Tomohide Terasoma (Univ. of Tokyo)  
Comodules over Bloch Hopf algebra associated to Aomoto polylogarithms  
16:30 – 17:30 Noriko Yui (Queen’s Univ.)  
Four-dimensional Galois representations of certain Calabi-Yau threefolds over \( \mathbb{Q} \)  

Organizers: Y. Goto (Hokkaido Edu.), S. Hosono (Gakushuin), N. Yui (Queen’s Univ.)
Title and Abstracts

Aug. 9
Kenji Hashimoto (Univ. of Tokyo)
Title: Mirror symmetry for complete intersection K3 surfaces in weighted projective spaces
Abstract: We discuss mirror symmetry for some special complete intersection K3 surfaces in four dimensional weighted projective spaces. In particular, we are interested in Dolgachev mirror symmetry.

Atsushi Kanazawa (Kyoto Univ.)
Title: Tyurin degenerations and Lagrangian fibrations of Calabi-Yau manifolds
Abstract: A Tyurin degeneration is a degeneration of a Calabi-Yau manifold to a union of two quasi-Fano manifolds intersecting along a common smooth anti canonical divisor. This is known to be an analogue of a Heegaard decomposition of a compact oriented 3-manifold into two handlebodies. I will discuss some interplay between Tyurin degenerations and Lagrangian fibrations, with particular emphasis on SYZ and DHT conjectures.

Hisanori Ohashi (Tokyo Univ. of Sci.)
Title: Topological classification of automorphisms on Enriques surfaces of order 4
Abstract: In a joint work with H. Ito, we classified involutions on Enriques surfaces some years ago. Based on this, we extend the result to order 4 including both semi-symplectic and non-semi-symplectic cases. This is a joint work with H. Ito (Nagoya).

Aug. 10
Shigeyuki Kondo (Nagoya Univ.)
Title: Borcherds products and K3 surfaces
Abstract: I will give a survey on an application of the theory of automorphic forms on bounded symmetric domains of type IV due to Borcherds to moduli spaces of lattice polarized K3 surfaces. I will discuss, for example, moduli of marked cubic surfaces, plane quartics, Enriques surfaces, ordered 6 points and 8 points on the projective line. All results in this talk are not new.

Kenichiro Kimura (Tsukuba Univ.)
Title: The Abel-Jacobi map for higher Chow cycles
Abstract: The Abel-Jacobi map $\Phi$ is a morphism from the group of homologically trivial algebraic cycles to a complex torus called the intermediate Jacobian. This
map was defined by Griffiths, and its image is described as certain currents. Later
Bloch generalized the map $\Phi$ to higher chow cycles. His definition was given in
terms of Deligne-Beilinson cohomology, and currents are implicitly used. We will
explain how to describe the image of $\Phi$ for higher Chow cycles as currents. The main
ingredient is admissible semi-algebraic chains constructed together with Terasoma
and Hanamura. As an application, we show that the Hodge realization of the polylog
cycles can be identified with $\Phi(\rho)$ for a certain relative higher Chow cycle $\rho$.

Ichiro Shimada (Hiroshima Univ.)

Title: The elliptic modular surface of level 4 and its reduction modulo 3

Abstract: The elliptic modular surface of level 4 is a complex K3 surface with
Picard number 20. This surface has a model over a number field such that its
reduction modulo 3 yields a surface isomorphic to the Fermat quartic surface in
characteristic 3, which is supersingular. The specialization induces an embedding of
the Néron-Severi lattices. Using this embedding, we determine the automorphism
group of this K3 surface over a discrete valuation ring of mixed characteristic whose
residue field is of characteristic 3. The elliptic modular surface of level 4 has a fixed-
point free involution that gives rise to the Enriques surface of type IV in Nikulin-
Kondo-Martín’s classification of Enriques surfaces with finite automorphism group.
We investigate the specialization of this involution to characteristic 3.

Tomohide Terasoma (Univ. of Tokyo)

Title: Comodules over Bloch Hopf algebra associated to Aomoto polylogarithms

Abstract: In the paper by Beilinson-Goncharov-Schechtman-Varchenko, they consider
a motives associated to Aomoto polylogarithms associated to hyperplane ar-
 rangement in affine spaces. In this talk, we construct a comodule over the Hopf
algebra defined by Bloch using his cycle complexes in normal crossing case. In this
talk, we use higher homotopy construction.

Noriko Yui (Queen’s Univ.)

Title: Four-dimensional Galois representations of certain Calabi-Yau threefolds
over $\mathbb{Q}$

Abstract: I will consider the four-dimensional Galois representations arising from
Calabi-Yau threefolds over $\mathbb{Q}$ with all the Hodge numbers of the third cohomology
groups equal to one. There are many examples of (families) of such Calabi-Yau
threefolds. The modularity/automorphy of such Calabi-Yau threefolds will be the
main topic of this talk. Conjecturally, such Galois representations should be associ-
ated to Siegel modular forms of weight 3 and genus 2 on some subgroups of $\text{Sp}_4(\mathbb{Z})$.
This is a preliminary report on this project.