Higher Dimensional Algebraic Geometry
(in honour of Professor Yujiro Kawamata's sixtieth birthday)

Date： January 7-11, 2013

Venue： Auditorium, Graduate School of Mathematical Sciences, the University of Tokyo

Title and Abstract：

1) Arnaud Beauville

Title： The L¥"uroth problem

Abstract:

The L¥"uroth problem asks whether every field K with $¥mathbb{C}¥subset K ¥subset ¥mathbb{C}(x_1,¥ldots ,x_n)$ is of the form $¥mathbb{C}(y_1,¥ldots ,y_p)$. In geometric terms, if an algebraic variety can be parametrized by rational functions, can one find a one-to-one such parametrization? After a brief historical survey, I will recall the counter-examples found in the 70's; then I will describe a quite simple (and new) counter-example. If time permits I will explain the relation with the study of finite simple groups of birational automorphisms of $¥mathbb{P}^3$.

2) Caucher Birkar

Title： Singularities in Fano type fibrations.

Abstract:

I will discuss singularities that appear on the base of a Fano type fibration, and mention the conjectures relevant to this problem. I will try to explain my results in this direction assuming boundednessof the log general fibres of the fibration.

3) Fabrizio Catanese

Title: (Some) Topological and transcendental methods in classification and moduli theory

Abstract:
The structure of the moduli spaces of surfaces and higher dimensional varieties is usually rather difficult to get hold of. Sometimes there are lucky situations, like the description of varieties whose universal cover is a polydisk or a symmetric bounded domain (joint work with Di Scala). Some other times the homotopy type of an algebraic variety may determine the structure of the moduli spaces, as for curves, Abelian varieties, Kodaira surfaces, varieties isogenous to a product, Beauville surfaces. I will then present some results on the Inoue type varieties recently introduced in joint work with Ingrid Bauer. Here a dominant role is played also by the study of moduli spaces of curves with a group G of automorphisms and its irreducible components: here, I will present recent joint work with Michael Loenne and Fabio Perroni, concerning irreducibility results for some special groups, genus stabilization, and some open questions concerning branching type stabilization a la Conway-Parker.

4) Lawrence Ein

Title: Asymptotic syzygies of algebraic varieties

Abstract:
I'll discuss my joint work with Rob Lazarsfeld on the describing the asymptotic behavior of the minimal resolution of an algebraic variety under a "very" positive embedding. We'll also discuss more recent joint work with Erman and Lazarsfeld on asymptotice of random Betti tables.

5) Osamu Fujino

Title: Fundamental theorems for semi log canonical pairs.

Abstract:
The notion of semi log canonical singularities was introduced by Koll¥'ar and Shepherd-Barron in order to investigate compactifications of moduli spaces of surfaces of general type. In this talk, I discuss various Kodaira type vanishing theorems, torsion-free theorem, and the cone and contraction theorem for semi log canonical pairs in arbitrary dimension.

6) Christopher Hacon

Title： On flips for 3-folds in Characteristic $p>0$

Abstract:
We will discuss recent work in progress with Chenyang Xu on the existence of flips and minimal models for 3-folds defined over an algebraically closed field of characteristic $p>5$.

7) Daniel Huybrechts

Title： More on cycles on (quartic) K3 surfaces

8) Jun-Muk Hwang

Title： Buser-Sarnak invariants of Prym varieties

Abstract:
The Buser-Sarnak invariant of a principally polarized abelian variety is the square of the minimal length of its periods, which determines the density of the sphere packing by the period lattice. Buser and Sarnak showed that the Buser-Sarnak invariant of a Jacobian variety J has an upper bound of order log (dim J). Using Lazarsfeld's result on the relation between Buser-Sarnak invariant and Seshadri number, Bauer showed that the Buser-Sarnak invariant of a Prym variety P has an upper bound whose order is the square root of dim P. It has been asked whether a bound of logarithmic order in dim P exists, in analogy with Buser-Sarnak's bound for Jacobians. We give an affirmative answer, using a recent work of Balacheff-Parlier-Sabourau.

9) Kawamata Yujiro

TBA

10) Alexander Kuznetsov

Title: Categorical resolutions of singularities

Abstract:
A categorical resolution of singularities of an algebraic variety Y is a triangulated category T with an adjoint pair of functors between D(Y) (the derived category of quasicoherent sheaves on Y) and T, such that the composition is the identity endofunctor of D(Y). If X-->Y is a usual resolution, the derived category D(X) with pullback and pushforward functors is a categorical resolution only if Y has rational singularities. However, I will explain that even if Y has nonrational singularities, still one can construct a categorical resolution of D(Y) by gluing derived categories of appropriate smooth algebraic varieties. This is a joint work with Valery Lunts.

11) James McKernan

TBA

12) Shigeru Mukai

Title: Enriques surfaces and root systems modulo 2

Abstract:
Enriques' counterpart of the Picard lattice of a K3 surface is the twisted Picard lattice and its modulo 2 reduction. These are powerful tools and govern both geometry and deformations of Enriques surfaces. As samples, I will explain how to use them in classifying the Enriques surfaces whose automorphism groups are (virtually) finite and in constructing Enriques surfaces with big finite symmetries.

13) Mircea Mustata

TBA

14) Yoshinori Namikawa

Title: Symplectic varieties of complete intersection and contact geometry

Abstract:
A symplectic variety X is a normal complex algebraic variety such that there exists a holomorphic symplectic 2-form ω on the regular part of X and ω extends to a holomorphic 2-form on a resolution of X. If (X, ω) is a singular affine symplectic variety embedded in an affine space as a complete intersection of homogeneous polynomials, then (X, ω) is isomorphic to the nilpotent variety (N, ω_{KK}) of a semisimple complex Lie algebra together with the Kostant-Kirillov 2-form.

15) Keiji Oguiso

Title: Smooth quartic K3 surfaces and Cremona Transformations

Abstract:
Among smooth hypersurfaces in projective spaces, quartic K3 surfaces have special properties also from the view of automorphisms. Inspired by a question of Gizatullin, I would like to explain the following two particular properties: (i) there are smooth quartic K3 surfaces whose full automorphism group is higly non-commutative, derived from the Cremonal transformations of the abient P3 but none of them is induced from PGL(P^3) except id, (ii) there are smooth quartic K3 surfaces with inifinite automorphism group such that none of them is induced from the ambient P^3 in any embeddings into P^3 except id.

16) Mihai Paun

Title: Semi-positivity results for relative adjoint transcendental classes and applications

Abstract:
We will discuss some recent results concerning the positivity of relative adjoint transcendental classes. As a consequence, we establish the surjectivity of the Albanese map associated to compact Kaehler manifolds with nef anti-canonical class.

17) Mihnea Popa

Title: Kodaira dimension and zeros of holomorphic one-forms

Abstract:
I will explain joint work with C. Schnell in which we show that every holomorphic one-form on a smooth complex projective variety of general type must vanish at some point, together with an appropriate generalization of this statement to arbitrary Kodaira dimension. The proof uses generic vanishing theory for Hodge D-modules on abelian varieties.

18) Miles Reid

Title: Diptych varieties

Abstract:
Diptych varieties are a large family of varieties, typically 6-dimensional, derived from a study of Mori extremal neighborhoods of type A. While not themselves toric varieties, they are constructed using the language of toric geometry and multiple serial unprojection. One can use them as Key Varieties in a number of contexts. For details see Gavin Brown's Diptych varieties website.

19) Vyacheslav V. Shokurov

TBA

20) Yum-Tong Siu

Title: Zariski closures of entire holomorphic curves and the abundance conjecture

Abstract:
We will discuss techniques and results concerning the Zariski closures of entire holomorphic curves and their relation to the problem of compactness of leaves of numerically trivial foliations in the abundance conjecture.

21) Yukinobu Toda

Title： Gepner type stability conditions on triangulated categories

Abstract：
I will introduce a particular class of Bridgeland stability conditions which I call Gepner type. These are important in finding constraints of DT invariants induced by autoequivalences, and naturally arise in the study of homotopy category of graded matrix factorizations. I will discuss some examples of Gepner type stability conditions, and show that a construction of such a stability condition on a quintic 3-fold leads to a conjectural stronger version of Bogomolov inequality.

22) Burt Totaro

Title： Symmetric differentials and the fundamental group

Abstract：
Consider a smooth complex projective variety X. Hodge theory shows that sections of exterior powers of the cotangent bundle are related to the topology of X. What about symmetric powers of the cotangent bundle? We discuss the relation between the topology of X and its "symmetric differentials". One interest of these results is that symmetric differentials give information in the direction of "Kobayashi hyperbolicity"; for example, they limit how many rational curves X can contain.

23) Claire Voisin

Title： Recent progresses on zero cycles on surfaces

Abstract：
I will explain in this talk two recent progresses on the Bloch conjecture on 0-cycles on surfaces. One result is the fact that symplectic involutions act trivially on CH_0 of a K3 surface. The other one is a proof of the Bloch conjecture for Campedelli and Barlow surfaces.

24) Chenyang Xu

Title: Dual complexes of singularities

Abstract:
Dual complex of a singularity is originally defined as the homotopy class of CW complexes which characterize how the exceptional divisors in a log resolutions intersect each other. Using MMP, for isolated singularities, we indeed find a canonical representative of the dual complex which is defined up to PL homeomorphism. The same method also answers the question that the dual complex of a klt singularity is always contractible. This is a joint work with de Fernex and Koll¥'ar.

25) Takehiko Yasuda

Title: The p-cyclic McKay correspondence

Abstract:
In this talk, we will discuss the McKay correspondence for the cyclic group of order p in characteristic p. Our main tool is the motivic integration generalized to relevant wild quotient stacks. This enables us to compute stringy invariants of the quotient variety. A consequence is that a crepant resolution of the quotient variety, if any, has topological Euler characteristic p.