TITLES AND ABSTRACTS OF TALKS AT THE "WORKSHOP ON SEVERI VARIETIES AND HYPERKÄHLER MANIFOLDS"

NOVEMBER 4-8, UNIVERSITY ROMA TOR VERGATA

LUCA BENZO (UNIVERSITY OF TRENTO)

Rational curves on $\overline{M_g}$ and K3 surfaces

Abstract: Let (S, L) be a smooth primitively polarized $K3$ surface of genus g and $f : X \to \mathbb{P}^1$ the fibration defined by a linear pencil in $|L|$. For f general and $g \geq 7$, we work out the splitting type of the locally free sheaf $\Psi_f^* T_{\overline{M}_g}$, where Ψ_f is the modular morphism associated to f. We show that this splitting type encodes the fundamental geometrical information attached to Mukai's projection map $\mathcal{P}_g \to \overline{\mathcal{M}}_g$, where $\mathcal{P}_g$ is the stack parameterizing pairs (S, C) with (S, L) as above and $C \in |L|$ a stable curve. Moreover, we work out conditions on a fibration f to induce a modular morphism Ψ_f such that the normal sheaf N_{Ψ_f} is locally free.

CHIARA CAMERE (LEIBNIZ UNIVERSITY HANNOVER)

Non-symplectic automorphisms of holomorphic symplectic manifolds of $K3^{[2]}$-type

Abstract: Recent work by Boissière, Nieper-Wißkirchen and Sarti has introduced a new tool for the study of automorphisms on irreducible holomorphic symplectic manifolds: their formula relates the cohomology groups of the fixed locus of the automorphism with numerical invariants of the invariant lattice inside $H^2(X, \mathbb{Z})$. I will report on a joint project with Boissière and Sarti about the classification of non-symplectic automorphisms of prime order of holomorphic symplectic fourfolds of $K3^{[2]}$-type.

THOMAS DEDIEU (UNIVERSITY OF TOULOUSE)

Lecture series on *Families of singular curves on surfaces* (3 times)
(based on joint work with C. Ciliberto, and with E. Sernesi)

Abstract: I will present two different approaches to families of singular curves on smooth surfaces (parametric vs. Cartesian), having in mind the characterizations of equisingularity and equigenericity. I will show how this enables one to prove the Arbarello–Cornalba and Zariski theorem, according to which every integral plane genus g curve is the limit of nodal curves having the same geometric genus g, as well as discuss various generalizations of it, with emphasis on the case of surfaces with numerically trivial canonical bundle. I shall carefully describe several traps in which one may fall along this path. I will analyze the behaviour of these families when one lets the surface degenerate. A number of open problems will be raised.

Margherita Lelli-Chiesa (University of Pisa)
Generalized Lazarsfeld-Mukai bundles and a conjecture of Donagi and Morrison

Abstract: Let S be a $K3$ surface and assume for simplicity that it does not contain any (-2)-curve. Using coherent systems, we express every non-simple Lazarsfeld-Mukai bundle on S as an extension of two sheaves of some special type, that we refer to as *generalized Lazarsfeld-Mukai bundles*. This has interesting consequences concerning the Brill-Noether theory of curves C lying on S. From now on, let g denote the genus of C and A be a complete linear series of type g^r_d on C such that $d \leq g-1$ and the Brill-Noether number is negative. First, we focus on the cases where A computes the Clifford index; if $r > 1$ and with only some completely classified exceptions, we show that A coincides with the restriction to C of a line bundle on S. This is a refinement of Green and Lazarsfeld's result on the constancy of the Clifford index of curves moving in the same linear system. Then, we study a conjecture of Donagi and Morrison predicting that, under no hypothesis on its Clifford index, A is contained in a g^s_e which is cut out from a line bundle on S and satisfies $e \leq g-1$. We provide counterexamples to the last inequality already for $r = 2$. A slight modification of the conjecture, which holds for $r = 1, 2$, is proved under some hypotheses on the pair (C, A) and its deformations. We show that the result is optimal by exhibiting some counterexamples obtained jointly with Andreas Leopold Knutsen.

Giovanni Mongardi (University of Bonn)
Ample cone and negative divisors for Hilbert schemes of points of $K3$ surfaces

Abstract: For $K3$ surfaces, the ample cone is cut out by rational curves of self-intersection -2. In the case of Hilbert schemes of points of $K3$ surfaces and their deformations, a similar result can be phrased using certain divisors whose top self intersection is negative.

Kieran O'Grady (University Roma Sapienza)
Zero-cycles and sheaves on a $K3$ surface

Abstract: Let X be a projective complex $K3$ surface. We will discuss the following result (partial results are due to Huybrechts and myself, the proof in general is due to Voisin). Let M be a moduli space of stable pure sheaves

on X with fixed cohomological Chern character: the set whose elements are second Chern classes of sheaves parametrized by the closure of M (in the corresponding moduli spaces of semistable sheaves) depends only on the dimension of M.

Arvid Perego (University Henri Poincaré Nancy)

Moduli spaces of sheaves over non-projective $K3$ surfaces

Abstract: In this talk I will present a joint work (in progress) with M. Toma about moduli spaces of slope-stable sheaves over non-projective $K3$ surfaces. The aim is to show that these moduli spaces are irreducible symplectic manifolds which are deformation equivalent to Hilbert schemes of points over projective $K3$ surfaces. We need to define a suitable notion of polarization and of genericity for polarizations to guarantee that these moduli spaces are smooth compact manifolds; as shown by Toma, they carry a holomorphic symplectic form. In order to show that they are irreducible symplectic manifolds, one still needs to show that they are Kähler and connected: this is shown by adapting an argument originally due to Tyurin, using twistor families and moduli spaces of slope-stable twisted sheaves. As an application, we show that moduli spaces of slope-stable sheaves are projective if and only if the base surface is projective.

Xavier Roulleau (University of Poitiers)

An effective computation of the Zeta function of the Fano surface of cubic threefolds

Abstract: The Zeta function of a surface encodes many interesting datas, for example if the Tate conjecture holds we can recover the Picard number of the surface. The Fano surface of a cubic threefold is the variety that parametrizes lines on a three dimensional cubic hypersurface. We know that the Tate conjecture holds for that surface. In this talk we will explain and describe an algorithm that computes the Zeta function of a Fano surface and derive some applications.

Edoardo Sernesi (University Roma Tre)

Mukai's program for curves on K3 surfaces

Abstract: Mukai proposed a method for reconstructing a $K3$ surface knowing a curve contained in it and gave a complete proof in genus 11. In a joint work with E. Arbarello and A. Bruno we extended his proof to every genus g, with g congruent to 3 mod 4 and greater than or equal to 15. In my talk I will outline the main steps of the construction.