

# SEMINARI DI NATALE 2022

December 19-20, 2022

## Location

Aula Dottorato (first floor), Dipartimento di Matematica F. Enriques, Via Cesare Saldini 50, 20133 Milano (Italy).

## Schedule

### December 19

14:00–14:50 Carolina Tamborini

15:00–15:50 Antonio Lorenzin

Break

16:30–17:20 Alessio Bottini

### December 20

9:15–10:05 Valeria Bertini

10:15–11:05 Margherita Pagano

Break

11:45–12:35 Benedetta Piroddi

## Titles and abstracts

**Carolina Tamborini:** *A topological construction of families of Galois covers of the line.*

We describe a new construction of families of Galois coverings of the line using basic properties of configuration spaces, covering theory, and the Grauert-Remmert Extension Theorem.

**Antonio Lorenzin:** *Bounded derived categories and strong uniqueness of enhancements.*

A recent article by Canonaco, Neeman and Stellari showed that derived categories of abelian categories have a unique enhancement. In this talk, we show that this result holds for all exact categories under the boundedness requirement. In particular, the bounded homotopy category of complexes over any additive category also has a unique enhancement. Afterward, we present a necessary and sufficient condition for the strong uniqueness of enhancements, providing some context in the known theory. This presentation is based on my recent preprint "Formality and strong uniqueness of enhancements".

**Alessio Bottini:** *Towards a modular construction of OG10.*

The known examples of hyper-Kähler manifolds are constructed as (possibly desingularized) moduli spaces of sheaves on holomorphic symplectic surfaces. It is believed that, similarly, moduli spaces of certain sheaves on hyper-Kähler manifolds could lead to new examples, but they have proven to be much more difficult to study. For this purpose, a new class of sheaves, called modular, was recently introduced. They have beautiful properties which make them good candidates to have well-behaved moduli spaces. In this talk, I will give the first example of a non-rigid modular stable bundle whose moduli space is birational to OG10.

**Valeria Bertini:** *Terminalization of quotients of hyperkähler manifolds via symplectic actions.*

Some of the most fruitful ways to produce irreducible symplectic varieties is to consider moduli spaces of sheaves on trivial canonical surfaces and partial resolution of symplectic quotients of smooth hyperkähler manifolds. In this talk I will focus on the second class of examples, especially in the case of fourfolds. In order to produce new examples, I will start from the known hyperkähler fourfolds (Hilbert schemes and generalized Kummer) and act symplectically on them with automorphisms induced by the underlying surface, for which a systematic analysis is possible. This is the content of a work in progress with Armando Capasso, Olivier Debarre, Annalisa Grossi, Mirko Mauri and Enrica Mazzon.

**Margherita Pagano:** *An example of Brauer-Manin obstruction to weak approximation at a prime with good reduction.*

A way to study rational points on a variety is by looking at their image in the  $p$ -adic points. Some natural questions that arise are the following: is there any obstruction to weak approximation on the variety? Which primes might be involved in it? Bright and Newton have proven that for K3 surfaces defined over number fields primes with good ordinary reduction play a role in the Brauer–Manin obstruction to weak approximation. In this talk I will give an explicit example of this phenomenon. In particular, I will exhibit a K3 surface defined over the rational numbers having good reduction at 2, and for which 2 is a prime at which weak approximation is obstructed.

**Benedetta Piroddi:** *K3 surfaces with a symplectic automorphism of order four.*

Symplectic automorphisms preserve the volume form of K3 surfaces: the minimal resolution of the quotient of a K3 surface  $X$  by a symplectic automorphism is therefore another K3 surface  $Y$ . Results by Nikulin allow to study symplectic automorphisms of K3 surfaces using lattice-theoretic techniques: in particular, it is possible to establish a moduli space correspondence between  $X$  and  $Y$ . If we ask that  $X$  be also projective, then we can distinguish countably many lattice-polarized families of  $X$ , which correspond to families of  $Y$ . Following the same approach used by Van Geemen, Sarti, Garbagnati and Prieto for the orders 2 and 3, we describe the isometry  $t^*$  induced by a symplectic automorphism  $t$  of order 4 on the second integral cohomology lattice of  $X$ . Having called  $Z$  and  $Y$  respectively the minimal resolutions of the quotient surfaces  $X/t^2$  and  $X/t$ , it is possible to describe the maps induced in cohomology by the rational quotient maps between  $X$ ,  $Y$ ,  $Z$ : with this knowledge, we are able to give a lattice-theoretic characterization of  $Z$ , and find the relation between the Néron-Severi lattices of  $X$ ,  $Y$  and  $Z$  in the projective case.