UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II
DIPARTIMENTO DI MATEMATICA E APPLICAZIONI "R.CACCIOPPOLI"

Hodge structures of K3 type of $(p,\, k)$-planes

Dr. Federico Fallucca
Università di Trento e INdAM

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Sunto: A $(p,\, k)$-plane is a flat Galois cover $X \to \mathbb{P}^2$ of the projective plane with Galois group $G \cong (\mathbb{Z}/p\mathbb{Z})^k$, where p is a prime number, and a branch locus with simple normal crossings. In this setting, we have several intermediate $(\mathbb{Z}/p\mathbb{Z})$-quotients $Y_1, \ldots, Y_n$ of X corresponding to the subgroups of G of index p. In this talk, we focus on the case where each Y_j is either a rational surface or has $p_g = 1$, with at least one intermediate quotient satisfying $p_g = 1$. A first result, which appears to be new in the literature, is that any $(\mathbb{Z}/p\mathbb{Z})$-cover of $\mathbb{P}^2$ with $p_g = 1$ has a K3 surface as its minimal model. As a consequence, when X is smooth, we have strong control over the weight-2 Hodge structure of the covering surface X, making the study of the the Infinitesimal Torelli Property and Tate and Mumford-Tate conjectures feasible. Thus, we classify all covers satisfying these conditions and obtain examples of surfaces of general type with positive geometric genus. During the talk, we will review some preliminaries on $(\mathbb{Z}/p\mathbb{Z})^k$-covers and explain how we classified those satisfying the mentioned property on the intermediate quotients. Finally, time permitting, we show how the decomposition of the transcendental part of the Hodge structure into simpler factors of K3 type allows us to prove the Tate and Mumford-Tate conjectures for these surfaces. This is joint work with M.Penegini and A.Ulivi.