

LTCC Advanced Course

Title: Torelli Theorems

Basic Details:

- Core Audience (1styr or 2nd/3rdyr: pure, app. or stats): pure
- Course Format (**Extended**: 5 x 2hr lectures) 5x2hr

Course Description:

- Keywords: torelli theorem, elliptic curves, hyperkahler manifolds, moduli spaces
- Syllabus: We will discuss different Torelli-type theorems. These theorems state that a geometric object can be uniquely reconstructed from its Hodge structure or period domain.

First, we will discuss curves and go through beautiful Andreotti's proof of the Torelli theorem for curves. Then we will go further and use the curves as our model example and discuss variational techniques.

Later, we will go through main details of the Torelli theorem for projective K3- surfaces based on the original proof of Piateckii-Shapiro and Shafarevich following Looijenga and Peters.

Then we will discuss more recent results for hyperkahler manifolds – Verbitsky's proof of Torelli theorem, and results of Baker-Lehn for singular symplectic varieties. If time permits we will discuss derived Torelli theorem.

- Recommended reading:

Baker B., Lehn C.: A global Torelli theorem for singular symplectic varieties

Looijenga, E. :Teichmuller spaces and Torelli theorems for hyperkahler manifolds.

Looijenga, E. and C. Peters: Torelli theorems for Kahler K3-surfaces, Compos. Math. 42 145–186 (1981)

Verbitsky, M.: A global Torelli theorem for hyperkahler manifolds, Duke Math. J. 162 2929–2986 (2013)

- Additional Optional reading:

Andreotti, A.: On a theorem of Torelli, Am. J. Math. 80 (1958) 801–828

Piateckii-Shapiro, I. I. and I. R. Shafarevich: A Torelli theorem for algebraic surfaces of type K3 Math. USSR, Izv. 5 547–588 (1971)

- Prerequisites: This course should be available for everyone with basic knowledge of complex geometry, though all needed objects will be defined during the course.

Format:

- No of discussion/problem sheets (typically 4 for with solutions): problem sheets
- Electronic lecture notes (these are strongly encouraged, as they will form the core of the individual study of the students): lecture notes provided
- Necessary support facilities:N/A

Lecturer Details:

- Lecturer: Nikon Kurnosov
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