

# FIM

# Nachdiplomvorlesung

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## Hyper-Kähler manifolds

2 October to 18 December 2017

Mondays, 10:15 - 12:00

HG G 43, ETH Zürich, Rämistrasse 101

### Abstract

Kähler geometry is a natural extension of complex projective geometry where the tools of Hodge theory are still available and allow to study the link between topology and complex geometry.

The simplest examples of projective complex manifolds deforming into non-projective ones are the abelian varieties (complex tori) of dimension at least 2. The subject of the lectures will be hyper-Kähler (or quaternionic) manifolds, which also share this property. This geometry was discovered by Beauville on the basis of Yau's fundamental work on existence of Kähler-Einstein metrics. From the metric viewpoint, complex tori are flat, while hyper-Kähler manifolds are Ricci flat with a restricted holonomy group but nontrivial curvature. Although this geometry may seem extremely restricted, there are many known (families of) examples, all built via algebraic geometry.

**Part 1** Introductory lectures on Kähler and Calabi-Yau geometry

**Part 2** Hodge theory and the period map: applications to deformation theory and topology

**Part 3** Constructing hyper-Kähler manifolds from algebraic geometry, and deformation types of hyper-Kähler manifolds via degeneration.

[www.fim.math.ethz.ch/lectures](http://www.fim.math.ethz.ch/lectures)