

Frontiers of Mathematics Lecture

Symmetries in Algebraic Geometry: Distribution of the Hodge Locus

Abstract

Hodge theory gives a linear algebraic fine structure on the Betti cohomology of an algebraic variety. Given a family of algebraic varieties indexed by an algebraic variety S , these "Hodge structures" vary and some of them have more symmetries (more "Hodge tensors") than the Hodge structure of a general member of the family. The Hodge locus is the set of algebraic varieties in the family that have more symmetries than a general member of the family. The fundamental result of Cattani, Deligne and Kaplan says that the Hodge locus is a countable union of algebraic subvarieties of S . We will discuss some recent results with Gregorio Baldi and Bruno Klingler giving some natural conditions to detect when the Hodge locus is dense in S or is an algebraic subvariety of S . Some examples will be given to illustrate the theory for families of abelian varieties or families of hypersurfaces of degree d in a projective space.



Professor Emmanuel Ullmo

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Biography

Emmanuel Ullmo graduated from École Normale Supérieure de Cachan (class of 1985) and holds a PhD in Mathematical Sciences from Université Paris-Sud (1992). He was Professor at Université Paris-Sud in 2001, and he became Director of the Department of Mathematics of Orsay and President of the Commission of Experts between 2007 and 2010. He was a member of the Scientific Council of the Centre Émile Borel from 2002 to 2006 and a member of the editorial board of *Inventiones Mathematicae* since 2006, being one of its two editors-in-chief from 2008 to 2014. He was appointed Director of the IHES at Bures-sur-Yvette, France since 2013.

Emmanuel Ullmo's research area is in arithmetic and algebraic geometry. He is interested in Diophantine questions on Abelian varieties and Shimura varieties, and he uses in parts of his works ideas of ergodic theory and of o-minimal theory in mathematical logic. Emmanuel Ullmo was an Invited Speaker at the International Congress of Mathematicians 2002 in Beijing. Between 2003 and 2008 he was Member of the Institut Universitaire de France. In 2006 he received the Élie Cartan Prize of the French Academy of Sciences for his work on the Bogomolov conjecture in arithmetic geometry. In 2022, he became a chevalier (knight) of the *Légion d'Honneur* (Legion of Honor) of France.

Date :

February 3, 2026 (Tuesday)

Time :

5:00 – 6:00 pm

Venue :

Lecture Theatre A, 1/F,
Chow Yei Ching Building, HKU