THE FIELDS INSTITUTE FOR RESEARCH IN MATHEMATICAL SCIENCES

Thematic Program on Calabi-Yau Varieties:
Arithmetic, Geometry and Physics

CLAIRE VOISIN

INSTITUT DE MATHÉMATIQUES DE JUSSIEU

Coxeter Lecture Series

November 13, 14, & 18, 2013

AT THE FIELDS INSTITUTE

The canonical 0-cycle of a K3 surface

November 13, 2013 • 3:30 p.m.

Beauville and I proved that an algebraic K3 surface S has a 0-cycle which is canonically defined modulo rational equivalence, and has the property that the intersection of any two divisors on S is proportional to it. I will review a number of properties of this cycle, some of which have been discovered by Huybrechts in his study of spherical objects in the derived category of S.

On the Chow ring of Calabi-Yau manifolds

November 14, 2013 • 3:30 p.m.

I will describe generalizations, some of which are conjectural, of the canonical ring of a K3 surface to higher dimensional hyper-Kaehler manifolds or to more general Calabi-Yau manifolds. For Calabi-Yau hypersurfaces X, for example, I show that the intersection of any two cycles of complementary nonzero dimension is proportional to the canonical 0-cycle (the intersection of a line with X). In the hyper-Kaehler case, the canonical ring is generated by the divisor classes and the Chern classes of the tangent bundle and it is conjectured that the cycle class map is injective on it.

Decomposition of the small diagonal and the topology of families

November 18, 2013 • 3:30 p.m.

The results on the Chow ring of K3 surfaces and of Calabi-Yau hypersurfaces are obtained by decomposing the small diagonal in the Chow group of the triple product X^3. In the case of a K3 surface, this decomposition has the following consequence on families $f : S \to B$ of projective K3 surfaces parametrized by a quasi-projective basis B: Up to shrinking B to a dense Zariski open set, there is a multiplicative decomposition of Rf_*Q, that is a decomposition as the direct sum of its cohomology sheaves, which is compatible with cup-product on both sides. This is reminiscent to what happens with families of abelian varieties, and is very restrictive on the topology of the family.

For more information: www.fields.utoronto.ca

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