Irish Geometry Conference 2015 – Abstracts

15 – 16 May, Mary Immaculate College, Limerick

Hans-Christian v. Bothmer – Friday 10.30 am

Rationality of hypersurfaces

I will review classical and modern results about the rationality of hypersurfaces and present our results (with Chrsitian Böhning and Pawel Sosna) regarding Kuznetsov's derived-category approach to the rationality question of cubic 4-folds.

Daniel Huybrechts – Friday 12 noon

The K3 category of a cubic fourfold

The derived category of a smooth cubic hypersurface of dimension four determines the cubic. However, due to a result of Kuznetsov the category contains a full subcategory that behaves in many respects like the derived category of a K3 surface. In this talk, I will explain what is known about it from a purely categorical point of view but also from a more Hodge theoretic perspective.

Brendan Guilfoyle – Friday 2.30 pm

Flowing a classical surface by its mean radius of curvature

In this talk I will present joint work with Wilhelm Klingenberg on the flow of a convex surface in Euclidean 3-space by its mean radius of curvature. Under this expanding flow, it is well known that the surface runs out to infinity, becoming round as it does so. In the talk I will outline our proof that the centre of this "sphere at infinity" can be computed from the spectral data of the surface. This result can be viewed in a number of ways: convergence of the normal lines of the flowing surface or a defintion of a "centre" for an arbitrary convex surface which is conserved under mean radius of curvature flow.

Nobuhiro Honda – Friday 4 pm

Some examples of twistor spaces of algebraic dimension one

It has been known that twistor spaces provide nice examples of compact complex 3-fold whose algebraic dimension takes all values from zero to three.

Most compact twistor spaces are of algebraic dimension zero, and also a lot of examples are already known of twistor spaces of algebraic dimension three. Also, twistor spaces of K3 surfaces, complex tori (and also some Hopf surfaces) form a good class of twistor spaces whose algebraic dimension is one.

In this talk, I will present twistor spaces of algebraic dimension one with a different flavor; namely I will present a series of simply connected twistor spaces of algebraic dimension one whose general fiber of the algebraic reduction is birational to an elliptic ruled surface. In these examples, a pair of Hopf surfaces are contained as a reducible fiber of the algebraic reduction.

David Wraith – Friday 5 pm

Positive Ricci curvature on highly connected manifolds

This talk concerns the existence of positive Ricci curvature metrics on compact $(2n - 2)$-connected $(4n - 1)$-manifolds. The focus will be largely topological: we will describe new constructions of these objects to which existing curvature results can be applied. The constructions are based on the technique of plumbing disc bundles. This is joint work with Diarmuid Crowley.

Ulrich Derenthal – Saturday 9 am

Cox rings over nonclosed fields

For a wide class of varieties over algebraically closed fields, Cox rings were defined and studied by Cox, Hu, Keel, Hausen, Hassett and others. We give a new definition of Cox rings for suitable varieties over arbitrary fields that is compatible with universal torsors, which were introduced by Colliot-Thélène and Sansuc. We study their existence and classification, and we make their relation to universal torsors precise. This is joint work with Marta Pieropan.

Sergey Mozgovoy – Saturday 10 am

Counting Higgs bundles

In this talk I will discuss a problem of counting semistable twisted Higgs bundles over a smooth projective curve defined over a finite field. I will also introduce the Donaldson-Thomas invariants for this problem and explain their relation to counting of indecomposable vector bundles over a curve. I will discuss an explicit formula for the above problem and its relation to the conjectural formula of Hausel-Rodriguez-Villegas. This is a joint project with Olivier Schiffmann.

Fabian Reede – Saturday 11.30 am

Vector bundles and Arakelov Geometry

We study vector bundles on the projective line over the integers and apply concepts of Arakelov geometry to these bundles. For example we compute their arithmetic Chern classes and derive the arithmetic Hirzebruch-Riemann-Roch theorem from the arithmetic Riemann-Roch theorem due to Gillet and Soulé. As an application we will compute the Ray Singer analytic torsion for all line bundles on the Riemann sphere.

Benjamin McKay – Saturday 12.30 pm

Bending metal sheets, Riemann surfaces and integrable systems

When you bend a metal sheet, without stretching, it deforms through isometric immersions of a Riemannian metric. Problem: for which surfaces is the differential equation of isometric immersion an integrable system? We find the first examples. We use ideas of Darboux relating complex geometry and integrable systems. Joint work with Jeanne Clelland, Tom Ivey and Peter Vassiliou.