

A symplectic geometry day in Milan

November 21st 2016

10.00-11.00 **Jonny Evans**: Lagrangian cell complexes and Markov numbers.

Joint work with Ivan Smith. In a degenerating family of complex projective varieties, with one singular member, there are cohomology classes (“vanishing cycles”) in the smooth fibre which disappear in the singular fibre. These vanishing cycles are more than just cohomology classes: they’re realised geometrically by Lagrangian subsets of the degenerating smooth variety. For example, the vanishing cycle of a nodal degeneration is a Lagrangian sphere. In this talk I will focus on the vanishing cycles of a class of surface singularities called Wahl singularities. Their vanishing cycles are cell complexes (we call them “pinwheels”). We deduce constraints on configurations of Wahl singularities in degenerations of $\mathbb{C}\mathbb{P}^2$ from nondisplaceability properties of the Lagrangian vanishing cycles. In particular, we give a symplectic topology explanation for the appearance of Markov numbers in this problem.

11:00-12:00 **Leonor Godinho**: Reflexive polytopes and symplectic geometry: 12, 24 and beyond.

The study of toric symplectic manifolds involves an interplay between symplectic geometry and combinatorics. We will discuss this interplay in the context of reflexive polytopes and explain the “12 and 24” property using symplectic geometry.

Lunch

14:00-15:00 **Joel Fine**: The symplectic geometry of twistor spaces.

The twistor space of a Riemannian 4-manifold M is a 2-sphere bundle Z living over M . Z carries two natural almost complex structures and traditionally complex geometry has been used to study Z (and hence M). It has long been known that Z also carries a closed 2-form which is sometimes symplectic. More recently this symplectic point of view has been exploited to prove results in both symplectic geometry and Riemannian geometry, but it seems there are many more avenues to explore. In the first part of the talk I will explain how the symplectic form on twistor space arises. In the second part of the talk I will give examples of how this leads to new results in both symplectic and Riemannian geometry. Finally, in the third part, and if time permits,

I will talk about a possible new direction for research: an analogy between symplectic manifolds with convex ends and so-called Poincarè-Einstein 4-manifolds.

Coffee break

15:30-16:30 **Yanki Lekili**: Homogeneous Lagrangians and Fukaya categories.