Workshop di Geometria Algebrica
Varieties with Trivial Canonical Bundle
Department of Mathematics "F. Enriques"
Sala di Rappresentanza
June 1st, 2012

Morning Session

11:00-12:00 *Wendy Lowen* (Universiteit Antwerpen)
Deformations of triangulated categories
We discuss the possibility of interpreting Hochschild cocycles for enhanced triangulated categories in terms of deformations. We develop an approach based upon constructions of twisted objects. We discuss the application to some particular cases like derived and homotopy categories of abelian and infinity categories.

12:15-13:15 *Xenia de la Ossa* (University of Oxford)
SEMINARIO MATEMATICO E FISICO
Geometry of Heterotic String Compactifications
I will discuss the geometry of heterotic string compactifications with fluxes. The compactifications on 6 dimensional manifolds which preserve N=1 supersymmetry in 4 dimensions must be complex conformally balanced manifolds which admit a no-where vanishing holomorphic (3,0)-form, together with a holomorphic vector bundle on the manifold which must admit a Hermitian Yang-Mills connection. The flux, which can be viewed as a torsion, is the obstruction to the manifold being Kahler. I will describe how these compactifications are connected to the more traditional compactifications on Calabi-Yau manifolds through geometric transitions like flops and conifold transitions. For instance, one can construct solutions by flopping rational curves in a Calabi-Yau manifold in such a way that the resulting manifold is no longer Kahler. Time permitting, I will discuss open problems, for example the understanding of the the moduli space of heterotic compactifications and the related problem of determining the massless spectrum in the effective 4 dimensional supersymmetric field theory. The study of these compactifications is interesting on its own right both in string theory, in order to understand more generally the degrees of freedom of these theories, and also in mathematics. For example, the connectedness between the solutions is related to problems in mathematics, for instance Reid's fantasy, that complex manifolds with trivial canonical bundle are all connected through geometric transitions.

Afternoon Session

14:30-15: 30 *Volker Braun* (Dublin Institute of Advanced Studies)
Toric Elliptic Fibrations and F-Theory
I will report on the ongoing classification of the elliptic fibration structure of Calabi-Yau threefold hypersurfaces in toric varieties. F-theory relates these to 6-d quantum field theories, which are tightly constrained by anomaly cancellation conditions. In particular, it suggests relations between Hodge numbers and elliptic fibration data that can be tested explicitly.

15:45-16:45 *Alessandra Sarti* (Université de Poitiers)
Prime Order Automorphisms on Irreducible Holomorphic Symplectic Manifolds
Let X be an irreducible holomorphic symplectic manifold which is deformation equivalent to the Hilbert scheme of 2 points on a K3 surface and let G be a group of prime order p acting on X. I present a formula relating the dimension of the cohomology groups over $\mathbb{F}_p$ of the fixed locus X^G and certain parameters of the G-invariant sublattices of $H^k(X,\mathbb{Z})$, k=2,4. This result generalizes an analogous formula for K3 surfaces and gives information on the structure of the fixed locus of G on X. As an application I study automorphisms of the Fano variety of a cubic fourfold. This is a joint work with S. Boissière and M. Nieper-Wisskirchen.

17:00 - 18:00 *Duco van Straten* (Johannes Gutenberg-Universität Mainz)
Conifold Period Expansions.
In the talk I will describe a particular one parameter family of Calabi-Yau 3-folds (with h^{12}=1) over P^1 with no point of maximal unipotent monodromy, but whose Picard-Fuchs operator is irreducible of order 4. This answers a question by J. Rohde. The operator is obtained by computing a specific "conifold-period" to sufficiently high order.