Berkeley-Stanford Algebraic Geometry Seminar

Tuesday, November 30, at Berkeley (Evans Rm. 939, 3:00–3:50 and 5:10–6:00)

MIHNEA POPA (Harvard): New intersection numbers on smooth varieties

Abstract: Given a smooth projective variety X of dimension n, embedded in projective space by a very ample line bundle, the degree of the variety can be regarded as the intersection number D^n, where D is a hyperplane section of X. The Riemann-Roch theorem, together with some known facts about cohomology, shows that the Hilbert polynomial of D has leading term $(1/n!)D^n$. The Hilbert polynomial generalizes to the case of an arbitrary divisor D (codimension 1 subvariety) as the dimension of the set of divisors of zeros of rational functions with poles only on D, and only of order at most n. Ever since Riemann people have tried to understand the growth in this more general case as well. For curves things are easy, and a famous theorem of Zariski explains what to do, in a very geometric way, for surfaces. In this talk I will discuss the background of this problem and some recent work with Ein, Lazarsfeld, Mustata and Nakamaye in which we define asymptotic analogues of the usual intersection numbers in order to extend the results above.

FRANK-OLAF SCHREYER (Saarlandes): An experimental approach to the moduli space of numerical Godeaux surfaces

Abstract: Numerical Godeaux surfaces are minimal surface of general type with no holomorphic 1 or 2 forms and $K^2 = 1$. The first classical known example due to Godeaux, is the quotient $X = Y/\mathbb{Z}_5$, of the Fermat quinitc $w^5 + x^5 + y^5 + z^5 = 0$ in $\mathbb{P}^3$ by the action by a fifth root of unity $g : (w, x, y, z) \to (gw, g^2x, g^3y, g^4z)$. Other examples with different fundamental groups are known. Constructions via double planes branched along very particular curves have been given as well. The expected dimension of the moduli spaces is 8. However only in case of a large fundamental group the constructions known lead to locally complete families. The most difficult case is apparently the case of simply connected Godeaux surfaces, where we only know the existence of a two dimensional family constructed by Barlow. In the talk I will out line an approach based on Computer algebra, to construct (what I believe is) the main family of Godeaux surfaces). The approach is a mixture of homological algebra, structure results, deformation theory and finite field experiments.

There will be a dinner afterward.

This seminar alternates between Stanford and Berkeley. To organize transportation from Stanford to Berkeley, please contact Jun Li or Ravi Vakil. Also, please let us know if you will stay for dinner, by Monday morning, so reservations can be made.

`http://math.stanford.edu/~vakil/s0405/`