

# SEMINAR COMPLEX SURFACES AND THREEFOLDS

BERND SIEBERT

**Time/Place:** Tuesdays, 10:15–11:45, Geom 432

**Description:** The purpose of the seminar is to get acquainted with some geometric aspects of algebraic geometry by studying selected, mutually largely independent topics in dimensions two and three. There is a large variety of possible topics with suggestions by the participants very welcome. Some proposals are given below to give an idea.

**Prerequisites:** At least an introductory algebraic or complex geometry in several variables. Some basic knowledge of algebraic and differential topology will also be useful, but is not absolutely necessary.

## Program

- (1) *Dario Stein*: Curves on surfaces — Intersection theory, adjunction, Nakai-Moishezon criterion, contractibility.  
([Ha] §V.1, [BHPV] Ch.II & III.2, [Be] Ch.I & II)
- (2) *Michael Stiller*: Surface singularities.  
([BHPV] Ch.III.3–7, [Ne])
- (3) *Tim Gabele*: Elliptic fibrations.  
([BHPV] Ch.V.7-13, [FrMo] Ch.I)
- (4) *Raffaele Caputo*: K3 surfaces.  
([BHPV] Ch.VIII)
- (5) *Arpan Saha*: Calabi-Yau threefolds.  
(e.g. [Hu])
- (6) *Mamoun Al Marashdeh*: Introduction to Mori theory.  
([Mo], [KoMo])
- (7) *Hanneke Wiersema*: Determinantal varieties.  
([Ha] Lect.9)

## REFERENCES

- [BHPV] W. Barth, K. Hulek, C. Peter, A. Van de Ven: *Compact complex surfaces*, Springer 2004.

- [Be] A. Beauville: *Complex algebraic surfaces*, Cambridge University Press 1996.
- [Do] I. Dolgachev: *Classical algebraic geometry: a modern view*, Cambridge University Press 2012.
- [FrMo] R. Friedman, J. Morgan: *Smooth four-manifolds and complex surfaces*, Springer 1994.
- [GrHa] P. Griffiths, J. Harris: *Principles of algebraic geometry*, Wiley 1994.
- [Ha] J. Harris: *Algebraic geometry — a first course*, Springer 1992.
- [Ha] R. Hartshorne: *Algebraic geometry*, Springer 1977.
- [Hu] T. Huebsch: *Calabi-Yau manifolds — a bestiary for physicists*, World Scientific 1992.
- [IsPr] V. Iskovskikh, Y. Prokhorov: *Fano varieties*, in: Encyclopedia of mathematical sciences, “Algebraic Geometry V”, Springer 1999.
- [KoMo] J. Kollár, S. Mori: *Birational geometry of algebraic varieties*, Cambridge University Press 1998.
- [Mo] S. Mori: *Threefolds whose canonical bundles are not numerically effective*, Annals of Math. **116** (1982), 133–176.
- [Ne] A. Nemethi: *Five lectures on normal surface singularities*, available at <https://www.renyi.hu/nemethi/pub.html>.