

# Complex Projective Threefolds

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The theme of our Research Project at HIM was the geometry of Complex Projective Threefolds. Eventually, however, the collaboration with the members of the other groups and with the many HIM visitors also produced results in areas not directly related to the main topic.

During our stay at HIM we worked together on the geometry of complex projective varieties. For instance, M. Penegini and F. Polizzi studied the existence of fibrations on irregular algebraic surfaces (see [1]), whereas F. Polizzi, A. Rapagnetta and P. Sabatino investigated the factoriality of threefolds with isolated singularities (see [2] and [3]).

Furthermore, the interaction of our group members with the researchers visiting HIM in occasion of the many workshops organized during the semester led to the paper [4] and its sequel [5], concerning an asymptotic bound for the number of connected components of the moduli space of surfaces of general type, and to the article [6], whose aim is to shed some light on the relationships among some notions of positivity for vector bundles that arose in recent decades.

As long-term HIM visitors and members of the Junior Trimester Program, we actively participated in several HIM activities. In particular:

- we organized the workshop *Geometry of complex threefolds* (March 10-13, 2014), which featured 2 minicourses (4 hours each), 4 invited talks and 32 registered participants;
- we took part in the organization of the Trimester Seminar, inviting the following people for a talk: Sonke Rollenske (Bielefeld), Marco Franciosi (Pisa), Gilberto Bini (Milano), Remke Kloosterman (Berlin), Stefano Urbinati (Padova);
- we organized two specialized seminars, held in parallel about twice a month: *Topology of singular hypersurfaces* (F. Polizzi, A. Rapagnetta and

P. Sabatino) and *Fibrations of surfaces to curves* (E. Mistretta and M. Penegini).

The HIM provided a very nice and friendly environment which helped us to pursue our research project and to cooperate in small groups. We greatly enjoyed the quiet atmosphere, the comfortable offices and the daily routine of coffee and cake. The interaction with the other groups of the Junior Trimester Program was quite interesting and stimulating. The central location of the Hausdorff Institute allowed us to have fruitful scientific exchanges with the researchers of both the University of Bonn and the Max-Planck Institute.

We are grateful to the HIM for funding our work and for giving us the opportunity of spending three productive months in the lovely city of Bonn.

## References

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- [3] F. Polizzi, A. Rapagnetta, P. Sabatino: *On factoriality of threefolds with isolated singularities, II*. Work in progress.
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- [5] M. M. Lönne, M. Penegini: *On asymptotic bounds for the number of irreducible components of the moduli space of surfaces of general type II*, [arXiv:1507.05779](https://arxiv.org/abs/1507.05779) (2015).
- [6] T. Bauer, S. Kovács, A. Küronya, E. Mistretta, T. Szemberg, S. Urbinati: *On positivity and base loci of vector bundles*, *European Journal of Mathematics* **1** (2015), no. 2, 229-249.