

EPDI/Leibniz stay at Mathematisches Forschungsinstitut

Thomas Kahle

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I stayed at Mathematisches Forschungsinstitut for five weeks in November and December 2011. My stay was organized through an EPDI fellowship. Originally I just wanted to join the Oberwolfach seminar on McKay correspondence, but I happily accepted Gert-Martin Greuel's invitation to stay a little longer. I also had a research guest for two weeks which I think is an absolutely fantastic opportunity that no other post-doc position can offer.

Time passed extremely quickly, but I was more productive than in any other five weeks this year. For the first two weeks I was joined by Johannes Rauh from Leipzig to work on a paper in algebraic statistics which we are writing with Seth Sullivant. In this project we study the connectivity of walks on lattice points in integer polytopes using decompositions of binomial ideals and polyhedral geometry. Understanding the connectivity of such walks is essential for integer programming and its applications in computational statistics. Before coming to Oberwolfach the paper consisted of a couple of LaTeX'ed technical paragraphs with no real structure. In the two weeks we systematically extended the results, rewrote them in a readable form, and developed the framework for applications in integer programming and statistics. At this point the paper is almost done. It is amazing how much progress is possible if one can focus on one and only one project. A preprint will be submitted to the Oberwolfach Series. During the second week Johannes and I attended the lectures of the Oberwolfach seminars on McKay correspondence and affine algebraic geometry which proved to be an interesting opportunity to learn new things.

My EPDI fellowship features frequent traveling and permanent exposure to inspiration. Therefore it is sometimes hard to sit down and digest all the experiences. My stay in Oberwolfach provided me with exactly the right conditions to process the happenings of this busy year. In the summer I had submitted a long and technical paper which, at the time of its writing, had become sort of a nemesis for me and my coauthor. In Oberwolfach I found the time to read my own paper with new eyes and outline the future strategy. This also proved valuable for several job applications that I submitted during my stay.

Week three and four were shaped by short trips to Konstanz and Frankfurt. In Konstanz I visited Daniel Plaumann and we started to explore what we call the *probabilistic radical* of an ideal—the intersection of those minimal primes whose varieties intersect the non-negative orthant. As probabilities are non-negative and real, this will be an interesting object for algebraic statistics. In Frankfurt I visited Christian Haase and we talked about toric varieties and lattice polytopes. We discussed some possible approaches to normality of CUT-polytopes, inspired by an open problem that Monique Laurent recalled on the open problem session in the workshop on combinatorial optimization. Having stayed in Sweden and England before, coming to Oberwolfach was a welcome opportunity to reconnect with colleagues in Germany.

My last week I used to wrap up and sort my thoughts. The workshop running was on stratified spaces and gathered an extremely interesting group of mathematicians with which I enjoyed many great dinner conversations. I also pursued some experimental mathematics and found a couple of interesting binomial ideals from integer lattices. For instance these ideals can have non-unital minimal primes even if the base lattice is saturated. The consequences of these discoveries remain to be explored.

Some people ask whether it is too quiet and lonely in Oberwolfach. For me it was certainly not. As outlined above, I was interested in some quiet time, and also there are always several Leibniz fellows present. Around 40 new mathematicians arrive every week and there are frequent special guests too. For instance, my stay overlapped with the visit of Agnes Handwerk and Harrie Willems who presented their documentary about Yuri Manin. To stay in shape, I went running in the hills behind the institute every other day—a highly recommendable way to gain more appetite for the excellent food while avoiding to gain weight at the same time. The weekends I used for short trips to the surroundings, for instance to Strasbourg and Zürich.

MFO is a fantastic place to do mathematics. This starts with the library and does not end with great staff that helped me before I knew I needed help. I also enjoyed the great furniture, especially the Fritz Hansen chair at my workplace in the library. I'd like to thank MFO and its staff for this unique opportunity. I can not make any constructive criticism because everything is perfect already. The memory of this stay will accompany me and I hope to be able to return.