

# My Oberwolfach fellowship

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This document describes interesting encounters, fascinating stories, and anything which I find particularly memorable about my 2011 Oberwolfach fellowship. I am focusing on the non-mathematical highlights.

## 1 A diary

I kept a “diary” during my stay in Oberwolfach, and here is an edited version of it.

**Combinatorics (1/3-1/8)** I teach students about lotteries in my undergrad classes, and mentioned this to some of the participants. Vera Sós (Renyi institute) told me she wrote a paper with Daniel Ornstein in 1964 on the lottery problem (how many tickets does one need to buy to be sure of two correct numbers). I have encountered so-called Ornstein-Uhlenbeck processes in my research, named after the same person! The article was published in some Hungarian journal which presumably has declined since then, but the library staff were able to give me the article. Füredi (UIUC) has done some more recent work, and I had a discussion with him on the Georgia lottery. Unfortunately, his bounds are too weak to say anything about the Georgia lottery. I bumped into József Solymosi (UBC) on a walk in the forest. He explained in the snow how some of my research is connected to number theory, an area I know nothing about. He invited me to join him and his son to Brussels, but unfortunately I had to decline. I met Noga Alon (Israel) right before he left. I mentioned to him that we haven’t been on the same lunch/dinner table, and in only seconds he produced an argument that the probability of this is about  $1/8$ . What a fast thinker.

Not surprisingly, many people in the combinatorics community are working on puzzles in their spare time.

**Set theory (1/9-1/15)** I knew nothing about set theory, but learned something about it. For instance, consider an elevator with 6 people, with an equivalence relation between pairs: either a pair of people knows each other or they don’t. Ramsey (originally a logician,

now Ramsey theory is often studied in combinatorics) theory tells you that there exists a three-tuple of people for which either all people know each other, or nobody in the tuple knows each other.

A PhD student participant told me that he wished his subject was more applied, but that he couldn't help falling in love with the subject. I think it's a nice way of putting it, I hope he fares well. Several participants admitted to me that the talks are hard to follow, since they are quite diverse... many require knowledge of the area to which logic is applied. Several of the big shots at the conference (Gamidor, Foreman) have apparently been able to disprove conjectures from other fields using techniques from logic. Several participants I talked to believe that this is the most promising direction in which the field of logic can develop. Interestingly, somebody else claimed that the participants have quite a homogeneous background, suggesting that he could follow all the talks.

**Stochastic analysis (5/29-6/4)** I know many people here, at least by name. On the first evening, there is one spot on our table left, and somebody young-looking apologetically asked if he could join even though we had already started. I look a little closer and I realize that it's Fields medalist Wendelin Werner! Of all the talks, I really liked Jean-Francois Le Gall's talk on random planar maps and tilings of the sphere. What a master of exposition! He described Schaeffer's bijection, pretty cool stuff. It's highly nontrivial, but he doesn't get lost in technicalities like many others.

**Arithmetic group theory (6/5-6/11)** Before this meeting I meet Zur, who will be here for the rest of my stay. He has a 6 month fellowship. On Sunday I pick up my wife and our 10-month old son Edwin! I get so excited when I see their train roll into the Offenburg station, and even more to see them again! Although she couldn't get a seat in the train's kiddie corner, she sat next to an old lady who didn't mind Edwin at all. The train was busy because it was the end of a long weekend. Many workshop participants chat to us about kids etc, one lady even had a baby younger than Edwin at home in Korea. Unfortunately the weather is pretty bad, so my family is pretty much locked up. Fortunately, Edwin likes the library, and he has some new ideas on the  $P \neq NP$  problem:



**Oberwolfach Seminars (6/12-6/18)** This week there are only young people, which gives completely different dynamics! I meet somebody who is interested in numerical techniques for PDEs with uncertain coefficients, there is some overlap with a project I am thinking about. I had a very insightful discussion with him. I also meet people from the other seminar on profinite groups. Somebody passionately tells me about Galois theory, which studies symmetries of roots of polynomials. Sounds very interesting, but I have had no exposure to this branch of math so far. Galois was an interesting guy, he has laid the foundation of modern group theory and was killed very young (mid twenties?) in a duel. On Friday, I have some beers and long discussions with Zur. One of these days we hope to go for a bike ride, but the weather is not good enough this weekend.

**Algebraic number theory (6/19-6/25)** Dinner with another Leibniz fellow, the director, and three young participants. The director tells stories about raising money towards the new library wing and towards the renovation costs. I meet a young researcher at this workshop, and I ask him if there are some theorems in number theory which could explain why the eigenvalues of the random-to-random shuffle are integer. All eigenvalues are algebraic integers by definition (roots of characteristic eq of a matrix with integers), and they must be integer if they lie in  $\mathbb{Q}$ . There may be some theorem giving a sufficient condition. Somebody else I asked about this point said that this is more of a combinatorial question than a number-theoretic problem. I agree, so there is probably little benefit from a number-theoretic point of view. Zur has been bitten by a tick, many of which are infected with lyme disease there. He rode the bike to the village several times to see the doctor and pick up antibiotics.

**Mathematics in Quantum Chemistry (6/26-7/2)** I have a visitor this week, so it's busy. This community seems very nice, the atmosphere is very friendly. It actually reminds me a bit of my own applied probability community. Life is so good here, I don't want to leave!

## 2 Social aspects

During my stay at Oberwolfach, workshop participants often asked me the questions: isn't it boring to be in Oberwolfach for an extended time? aren't you lonely despite meeting many new people?

Sometimes I felt lonely and bored, but not very often. I felt increasingly better about it during my stay, and weekends felt shorter and shorter. I think it helped a lot to have several young long-term researchers stay in Oberwolfach at the same time, so that there are a few people you get to know better. On one particularly memorable night, I had some wine with Zur and one of the Japanese long-term guests, Atsushi. (About three young Japanese researchers were accomodated by MFO as their home university was heavily hit by an earthquake.) Atsushi had an authentic Japanese pen (a kind of brush-pen) and he taught us how to write our first Japanese words. It's quite challenging!

I think it was a good idea to split my fellowship up into two pieces (2 weeks, 5 weeks). I could attend the workshops I was most interested in, and the time period was not too long. As for the 5-week period, I had my family visit for one week in the middle and a visitor in the last week. Thus, I felt that 'action' was always imminent.