

MENTORING AFRICAN RESEARCH MATHEMATICS GRANT FINAL REPORT

MICHAEL DRITSCHEL, NEWCASTLE UNIVERSITY

1. FIRST YEAR

As part of the Mentoring African Research Mathematics programme, I travelled to Rabat, Morocco, from 10 to 28 September 2014. The aim of the visit was to get to know something about the Department of Mathematics at Université Mohamed V in Rabat. My hosts in Rabat were Omar El-Fallah and Nouzha El Yacoubi, though nearly all of my time was spent with Omar on this first visit since Nouzha had to be out of town because of family matters. While there, I gave a series of talks on operator and function theory, giving the background needed for a colloquium talk I then gave on rational dilation problems. During my visit I spent quite a lot of time discussing mathematics with Omar and several of his students, in particular Youssef Elmadani. I got to know Abdelouahab Hanine, a former PhD student of Omar's who now has a position at Université Mohammed V, Rabat. I also spent time talking with several other of Omar's colleagues, including Hassan Zerouali and his students.

For three days during this first trip I went to Meknes, where there was CIMPA Research School on "Operator Theory & the Principles of Quantum Mechanics". The local organiser was Nadia Boudi, who has since joined the mathematics group in Rabat. She gave me a clearer picture of the state of Moroccan mathematics outside of the main centres such as Rabat. I also had a chance to meet analysts from other Moroccan universities, including Meknes and Oujda, as well as a few from the University of Abou Bekr Belkiad in Algeria. While in Meknes, Nadia arranged for me to meet with Hassan Sahbi, the Dean of the Faculty of Sciences at Moulay Ismael University (Meknes), as well as Mercedes Siles Molina, a representative from CIMPA and Claude Cibils, the director of CIMPA, who briefly visited during the meeting. In this way I came to some understanding of the efforts of others in fostering African mathematics. CIMPA is a part of UNESCO, and while a number of European countries are actively involved in it and the president, Sheung Tsun, is based at Oxford, there seems unfortunately to be no direct UK support.

Without exception, on this first visit I found the mathematicians I dealt with to be warm and friendly, with a deep and knowledgeable interest in functional analysis. It was a true pleasure to spend time discussing mathematics with them, and I came away with a much clearer picture of where their mathematical interests lie.

It had been intended that two of Omar's postgraduate students, Hatim Naqos and Youssef Elmadani would visit Newcastle University in May of 2015. However we discovered that the letter provided was insufficient for obtaining the necessary visas. At this point it was too late to arrange anything for the spring term, and due to various reasons, the visit was postponed until February of 2016.

2. SECOND YEAR

Hatim and Youssef visited Newcastle from the 13th to the 27th of February. They had the standard office space and computing facilities offered to visitors. The office they shared was close to that of the postgraduate students, and they spent time getting to know some of the students in functional analysis as well as regularly meeting with me. Both were in the final year of their studies, so I persuaded them to give talks in a special analysis seminar which was organised on the 24th of February, Hatim speaking on “Asymptotic behaviour of eigenvalues of Toeplitz operators on the weighted analytic spaces” while Youssef’s title was “On Dirichlet type spaces”. The results they presented were very nice, and despite feeling a bit uncertain about their English language abilities, they managed quite well. They were accommodated in the city centre at the Royal Station Hotel, which was used for all the visitors on this grant. Besides being right next to the central station, it is very convenient to restaurants and other facilities in Newcastle.

The next visit was by Nouzha El Yacoubi, who was in Newcastle from the 23rd to the 29th of May. While Nouzha is no longer research active, she is very busy in the administration of the Department of Mathematics at Université Mohamed V, and more generally in the mathematical community in Morocco, as well as Africa as a whole (for example, she is heavily involved in African Women in Mathematics Association and in teacher training). In July 2017 the 9th Pan-African Congress of Mathematics (PACOM) will be held in Rabat (www.fsr.ac.ma/PACOM2017/), and Nouzha is the principle organiser. I have been honoured to be invited to participate as a member of the scientific committee and as a speaker at the congress.

We had initially thought that Omar would also visit Newcastle towards the end of June. However, he ended up having to travel to Nairobi where he was awarded the AMMSI-Philip Griffiths Medal at the beginning of July, so this was not possible. The LMS kindly allowed us to extend at no cost the time period of the grant until the end of September. Omar was then able to visit from the 11th to the 16th of September with two students, Hamza Elazhar and Hafid Bahajji-El Idrissi. Hamza gave a short talk on his work, and Omar gave a seminar talk on 13 September on “Asymptotic behaviour of the singular values of Toeplitz and composition operators”. Hafid is one of the students of Hassan Zerouali who I met on my previous visit. He and Hassan have been working on multidimensional moment problems and have several interesting papers on the topic on the arxiv. It happens that this is one of the areas that David Kimsey, who was recently hired in Newcastle, works. Hafid and David spent quite a bit of time discussing mathematics. Hassan is now trying to arrange for David to visit Rabat (David’s wife just had a child, so this is difficult in the immediate future, but he is interested in going).

I then made a final visit to Rabat from the 20th to the 26th of September. The visit was timed in part to coincide with the “Colloque de Mathématiques en l’honneur des mathématiciens marocains à l’étranger” in Kénitra at Université Ibn Tofaï, a meeting organised on the one hand to bring together mathematicians from the Moroccan mathematical diaspora with those who have remained in the country, and on the other to work on reconstituting the Moroccan Mathematical Society, which had been started in the 90s but then become moribund. While most mathematics meetings that I attend have a mixture of good and bad speakers, here virtually all were exceptional. What is more, despite the broad range of topics, the audience carefully paid attention to the speakers (no mobile phones or laptops visible!), and then there tended to be rather lengthy discussions at the ends of talks. It was in a way how you dream a mathematics meeting should be. In the evenings there were lengthy discussions on how to make the new society a success, and you get the feeling that they will indeed manage.

Another interesting aspect of the meeting is that in looking around, it became apparent that whereas many of the older generation got their degrees abroad, mainly in France (though some in the US and Canada), many of these mathematicians came back to Morocco, and at least at the larger universities as in Rabat, are well enough supported to have successful research careers. Omar is a star example of this. These mathematicians in turn are training the next generation in Morocco, and you find very few students nowadays who feel the need to go abroad to get the education they desire. The system is quite competitive, and the students you meet who manage to get into the PhD programme in places like Rabat are very strong, on par with the best in many places in Europe and the US.

Omar and I have discussed various mathematical problems during our visits, and while our research interests have tended to be quite different, we are developing a project which incorporates those aspects which we have in common with the intention of eventually publishing something together. I also had fruitful discussions with Hassan Zerouali since I also have an interest in multidimensional moment problems. Omar is planning to visit Newcastle in April for the LMS invited lecture series which will be given here by Jim Agler, and he will most likely bring a student with him as well (it has not been decided who at this point). In addition he has invited me to come back to Morocco in May for another research visit.

3. CONCLUDING REMARKS

I would say that despite things working out somewhat differently than first envisaged, the project has been a success. I have met a number of very good mathematicians, many who I now consider friends, and come away with a feeling of the vibrancy of their community. The two organisers on the Moroccan end visited Newcastle, along with four postgraduate students, and they have begun to forge ties with British mathematics.

This is not to say that there are not some shortcomings, but these are things that will eventually be addressed or worked around in novel ways. For example, internet connectivity is virtually non-existent through Moroccan universities, though most people manage this through their own internet service providers. This of course means that access to resources such as MathSciNet are restricted. Libraries even in places like Rabat, are not great, and salaries are not enough to allow people to buy many mathematics books. Some end up resorting to pirated copies on the internet. It would be worthwhile if some sort of arrangement could be worked out with some of the major publishers like Springer, the AMS and the LMS to publish regional versions of their books at reduced prices, much as is done in India for example. Finally, mathematics has historically tended to be mostly a male pursuit, while in places like the UK and US, attempts are being made to redress this. This is done initially by ensuring that more women are trained in the field at the postgraduate level, and that these women then begin to fill roles professionally. In Morocco, you find that with some notable exceptions, the involvement of women in mathematics is very limited. There are some women studying mathematics, but for example at the meeting in Kénitra, one tended to see them only on the last day which was a Saturday, perhaps due to family obligations. Because of the nature of the culture, this unfortunately will be a more difficult problem to overcome.