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**Report on my visit to the
Institute of Mathematical Research (INSPEM)
<http://www.inspem.upm.edu.my/>
University Putra Malaysia, Kuala Lumpur, Malaysia
March 14-19, 2014**

From March 14 to 19, 2014, I was invited to visit the Institute of Mathematical Research (INSPEM), one of the 9 institutes of the University Putra Malaysia in Kuala Lumpur (Malaysia). The starting point of this invitation was a suggestion from Alla Ditta Raza Choudary that this institute could be considered by the European Mathematical Society to receive the *Emerging Regional Centres of Excellence (ERCE)* label – see

<http://euro-math-soc.eu/EMS-CDC/erce.php>

Since I was going to participate to the *18th International Mathematics Conference* in Dhaka from March 20 to 22, I decided to make the detour and to visit INSPEM on my way to Bangladesh.

I reached KLIA (Kuala Lumpur International Airport) on Friday, March 14. Firhaus welcomed me at the airport, he took care of me during all my stay in Kuala Lumpur and drove me back to KLIA on March 19. I am thankful to him and also to Kathi, they gave me the opportunity to have interesting sightseeing visits on Saturday and Sunday.

On Monday, March 17, morning, I had an appointment with Maxime Feraille, attaché de coopération universitaire et scientifique, directeur of the centre universitaire franco-malaisien. During this meeting, several possibilities of developing the cooperation between France and Malaysia in mathematics were considered, and I am optimistic that some of them will be realized. Some French mathematicians already visited recently or will visit soon INSPEM, including Abderrahmane Nitaj (Université de Caen), Andreas Enge (Institut de Mathématiques de Bordeaux), Laurent Poinot (Paris 13). Besides, Oon Shea Ming (Institute of Mathematical Sciences, University of Malaya) received his PhD thesis from the University of Nancy (my home town) under the supervision of Joël Rivat.

Mathematics is one of the weak points of those students in Malaysia who apply to enter some engineering school in France. It would be appropriate that French mathematicians help developing mathematics at the highest level in Malaysia.

During my visit, I had several meetings with the management team and heads of programs, I had quite substantial discussions with the colleagues, and this enabled me to learn a lot more on the Institute and its activities.

Before coming to Malaysia, I already had some information on this institute, firstly thanks to the website

<http://www.inspem.upm.edu.my/>

then directly from its Director, Kamel Ariffin Bin Mohd Atan, by email, in connection with the ERCE scheme. However, I had a number of questions to raise on the activities of this Institute, and my visit enabled me to have a better view of the situation. For instance it was not clear to me how much fundamental research in basic mathematics was developed. The names of the laboratories do not provide a good view of the reality: this institute does not deal only with mathematics related to other sciences. Also the number of visitors and of students (Master and PhD) and their origin were known to me before coming.

The international relations of the Institute are extensively developed, the number of scientific visitors is quite substantial : 105 for the period 2002–2013, including 15 in 2013 only. These visitors come from Malaysia as well as Argentina, Armenia, Australia, Austria, Bangladesh, Canada, China, France, Germany, India, Indonesia, Iran, Irak, Italy, Japan, Kyrgyztan, New Zealand, Oman, Pakistan, Romania, Russia, Saudi Arabia, Singapore, Spain, Sudan, Switzerland, Turkey, UK, USA, Uzbekistan, Vietnam.

INSPAM has signed 11 MOU, with institutes in countries like USA, Vietnam, Scotland, Turkey, Uzbekistan, New Zealand, Italy. A large number of conferences and seminar are organized: 95 altogether, including 10 in 2013.

The four laboratories of the Institute are

- Laboratory of cryptography, analysis and structures
 - cryptography and computational number theory
 - Structural theory of algebras
 - Functional analysis and topology
- Laboratory of computational sciences and mathematical physics
 - Computational mathematics and scientific computing
 - Mathematical physics and engineering
- Laboratory of computational statistics and operations research
 - Modeling and computational statistics
 - Reliability analysis and complex systems
 - Computational operations research
- Laboratory of Ethnomathematics and didactics
 - Ethnomathematics
 - Didactics in mathematics
- Laboratory of statistical and computing services

There is also a section of High Performance Computing Services.

The university has several scholarship programs:

- IGRA : International Graduate Research Assistant

- ISRGA : International Special Graduate Research Assistant
- IGRF : International Graduate Research Fellow

The monthly allowance received by the selected students is 1500 RM¹ for MSc and 1800 RM for PhD, while the cost of accommodation in dormitory for bachelor students is only 15 RM/day. The registration fees (2000 RM per semester) are waived for the selected students. Usually, an international student comes with his or her own funds, after two to three months he may apply to receive one of the above mentioned scholarships from the university (or some other scholarship from the Government, there are several sources). Hence it is possible for students who do not receive support from their own government (examples are Cambodia and Nepal) to pursue their studies in Malaysia, provided that they receive a minimal support to start with (airline ticket plus funds for, say, 3 months). The main purpose of the ERCE scheme is to create networks of centers where students from neighboring countries can easily pursue their studies at an international level, and this task is already realized by INSPEM.

The funds of the Institute originally came only from the government, but progressively the Institute had to find financial support for an increasing percentage of its budget. The University launched its own company in order to contribute to this goal. These funds come from several sources, including a number of patents (especially in cryptography), consultancy (in cryptography but also in statistics and in modeling theory for instance), as well as the registration fees for the students who are able to afford them - a number of foreign governments, for instance in the Gulf countries, support their students. There is a strong collaboration with industries (39 national, 13 international - Austria, Poland, Iran, Cambodia, Indonesia, Switzerland, Korea).

The way the students are treated is interesting: for each PhD student there is a committee of three mathematicians, including the thesis advisor (and the codirector in case of a joint supervision) taking care of following the students' progress. When a foreign student arrives at INSPEM, he or she first passes tests to evaluate his or her level; he is taught which courses he should attend at the master level before pursuing at the PhD level. These tests and courses include also the English language. Every month there is a meeting between staff members and the representatives of the students, where they can raise their concerns and mention difficulties they may face.

There are now some 10 master students (including 5 international ones), 33 PhD students (including 24 international ones). Besides, 26 students completed a Master and 42 a PhD since the start of INSPEM in 2002.

Half of the foreign students come from Iran. The other ones come from Bangladesh, Ghana, Indonesia, Irak, Jordan, Libya, Nigeria, Pakistan, Palestin, Saudi Arabia, Sudan, Tanzania, Uzbekistan, Yemen.

- Among the topics which are developed in INSPEM, I wish to highlight the following ones:
- *Cryptography*. The Director, Kamel Atan, has also contributions to number theory (exponential sums) and graph theory. In the cryptography group, Muhammad Said studies a cubic extension of the Lucas crypto system which may lead to interesting questions in algebraic number theory.
 - *Theoretical Physics*, under the leadership of the deputy director of INSPEM, Hishamundi

¹in March 2013, 1 Euro is 4.557 MYR Malaysian Ringgit.

Zainuddin.

- *Functional Analysis and topology.* This section covers a large domain of analysis including distribution theory, differential equations, complex analysis and wavelets, under the direction of Adem Kiliçman.
- *The structure of algebras.* Isamiddin Rakhimov and his group study the structural theory of Lie algebras and the classification problem of finite dimensional Leibniz algebras.

Another topic worth to mention is *statistics* (with Mahendran Shitan), the emphasis being more on the applied side.

On Tuesday, March 18, I gave three talks. The first one was on the *Committee for Developing Countries* of the *European Mathematical Society*, where I explained in particular the ERCE scheme. The second one was on the *Centre International de Mathématiques pures et Appliquées CIMPA*, where I explained the process for submitting a Research School proposal. The third one was a mathematical lecture on *Some of the most famous open problems in number theory.* The pdf files are on my website <http://www.math.jussieu.fr/~miw/>

I hope that this visit of mine will have consequences; one of them could be a CIMPA Research School, something which was already suggested by Raza Choudary during his previous visit. For such a school to take place in 2016, the proposal should be submitted in 2014, with a pre project before the middle of June 2014 and the final project before the end of September 2014. In such a case, it would be a good idea to have a SEAMS School here in 2015 as a preliminary step before the CIMPA School <http://seams.maths.web.id/>

I plan to meet several of the colleagues from Malaysia in Seoul in August 2014, for the ICM, but also on August 12, the day before the opening session of ICM 2014, for the MENAO event. I plan also to come back, maybe for the international conference which could take place in August 2015, maybe also for a two weeks visit including a joint research project with Kamel Atan and Muhammad Said.

During my first meeting on Monday with the staff and heads of projects, a question was asked to me concerning the visibility of Malaysia Mathematics. At the end of my stay I came up with the suggestion of preparing a survey on the history, development and present state of mathematics in Malaysia - ICM 2014 could be an opportunity to distribute such a survey and increase awareness among the international mathematical community.

The local expenses for my visit were covered by the Institute INSPEM, I had only to pay myself the international fare. I wish to thank warmly the Institute, and in particular its director, for the exceptional reception they gave me, including remarkable meals (we were lucky that the weather was clear when we had a dinner at the restaurant Atmosphere 360 on top of Menara KL Tower). I am confident that this first visit of mine to his institute will not be the last one and will lead to interesting developments.

