

**REPORT OF THE RESEARCH SCHOOL “ANALYSE NUMÉRIQUE ET
ÉQUATIONS AUX DÉRIVÉES PARTIELLES”
IFRANE (MOROCCO), MAY 1 – 10, 2017**

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This Research School took place at Al-Akhawayn University (<http://www.aui.ma/en/>), in Ifrane, Morocco.



FIGURE 1. Al-Akhawayn University

This is a private University, dating from 22 years ago, that was founded thanks to the financement of His Majesty King Hassan II of Morocco and Crown Prince Abdallah bin Abdel-Aziz of Saudi Arabia. It is an English-language, american-curriculum university, with 2039 students in 2014 ¹. Ifrane is a quiet town, located in the Middle Atlas region of Morocco, at about 65 km far from the cities of Meknès and Fès. The natural way to arrive there is via Fès airport, and to reach Ifrane from Fès the best way is to hire a grand-taxi, as other kind of communications are not easily available.

The school was dedicated to honor Ahmad el Soufi, who was the Scientific Officer of CIMPA in charge for this school, and sadly passed away unexpectedly some months ago. It began on Monday, May 1st, with the opening ceremony. The people who spoke were:

- (1) Prof. Mohamed Rhoudaf, local organizer of the School.
- (2) The vice-president of University Moulay Ismaïl de Meknès.
- (3) The Dean of the Faculty of Sciences of Meknès.
- (4) The Dean of School of Science and Engineering of Al-Akhawayn University.
- (5) Marie-José Mahé Guillevin, representing the Spanish Embassy in Morocco.
- (6) Jorge Mozo Fernández, representing CIMPA.
- (7) Prof. Otared Kavian, external organizer and Prof. François Murat, who dedicated some words to honor Ahmad el Soufi.
- (8) Abdellatif Chaïra, President of the *Société Marocaine de Mathématiques Appliquées*, on behalf of the organizing committee.

Also, invited to this ceremony there were the Director of the *École Supérieure de Technologie* of Meknès, the Director of the Mathematics Department, and the vicedirector of the *Académie Militaire Royale*.

¹Source: Wikipedia

The scheduled courses of this School were:

- (1) François Murat: Consolidation des connaissances en Analyse et EDP.
- (2) Luc Tartar: Vers de meilleurs modèles mathématiques en Physique.
- (3) Mohamed Seaid: Méthodes semi-lagrangiennes pour des équations de convection-diffusion.
- (4) Mourad Choulli: Problèmes inverses elliptiques.
- (5) Claire Chainais-Hillairet: Introduction à l'analyse numérique de schémas volumes finis.
- (6) Youssef Oukhine: Équations différentielles stochastiques.
- (7) Otared Kavian: Semi-groupe de la chaleur et théorèmes de régularité pour les équations elliptiques.

In the original project, there were a course of Gregoire Allaire, who finally had to cancel his participation due to a mountain accident, and he was replaced by Otared Kavian. In addition of these courses, some tutorial sessions were scheduled at the end of the day (some days), and also some conferences from the participants.

The number of participants at this School was big: 122 persons. CIMPA financed, totally or partially, 13 students. Among these students, one of them cancelled his participation before the School due to academic reasons, and two others finally didn't come (one of them had confirmed and one not). So, CIMPA financed a total of 10 foreign students, coming from Argelia (8 students), and Tunisia (2 students). Some other foreign students came, from Argelia (3 more students), France (2 students), Mauritania (1 student) and Senegal (3 students).

The courses took place the first days at the big auditorium of the University, a big hall very well equipped with blackboards and projectors, and after the fourth day, in another classroom, smaller than the previous one, but also well equipped. Everybody had lunch at the University restaurant, where the organizers had reserved some spaces and a fixed menu. I must say that the menus were very good, even if not always moroccan-style. On Wednesday May 3rd, an optative excursion was organized to Oum Errabiaa waterfall, located almost four hours bus away!

Most of the students were lodged in some apartment buildings in town, that the organizers had rented at a very convenient prize. According to some students lodged there, this accomodation was good, and very well situated, at walking distance from the University. The speakers and some students (for instance, most foreign students) were lodged at Farah Inn (<http://farahinn-ifrane.com/>), a holiday resort located far from the city center, in a rather isolated place. This resort consisted in a number of appartments and chalets, were at most four people could be lodged. Due to the distance of the University, a bus had to take the students to the university and back (except the first day where no bus appeared, and I had to pay myself taxis for the students). Moreover, there were not eating places in the surroundings, so, the



FIGURE 2. Participants financed by CIMPA



FIGURE 3. Courses of Luc Tartar and François Murat

organizers took the speakers and me everyday in town to have dinner. For the students lodged there it was perhaps not the most convenient situation.

All the speakers made a great effort in communicating to the students, and had frequent conversations and mathematical discussions with them outside the courses. The courses were very interesting, as is expected of a school of this kind. For instance, F. Murat's course was rather elementary, explaining very carefully the basics about distributions and related notions. Luc Tartar, in words of one of the organizers, is a *walking encyclopedia*, and a great communicator. All the other speakers also made courses of a great level. Some of the students even participated spontaneously in the courses. All of them were very appreciated by the students.



FIGURE 4. Senegalese student participating

des frais d'inscription". In the web page of the event it was told that the inscription fees covered meals, coffee breaks and documentation. According to this, some students understood that they could come, and they didn't had to pay for their meals, and some of them came without notice (from Argelia, Mauritania and Senegal), which caused a certain problem, due that these expenses were not scheduled. CIMPA is going to eliminate the inscription fees from 2019 (in this School one student from France had paid them), but nevertheless I advice to be more precise

The local organizers made a great job, due to the big number of assistents. In particular, local organizer Mohamed Rhoudaf was omnipresent, taking care of everything. Otared Kavian, as external organizer, took care of the speakers, and of the practical organization of the schedule. He also conducted some tutorial sessions. The communication with them, before and during the school, was fluent and sincere. The only point I would like to remark is the following: in the letters received by the foreign students that were not financed by CIMPA it was said that "*Le séjour sera à votre charge*", et "*Le CIMPA vous dispense*

in the letters, in order to avoid such misunderstandings, that had, as a consequence, a problem with the scheduled budget.

I would like to warmly thank the Spanish Embassy, that I contacted some weeks before the school, and that sent a representative to the opening ceremony. I had the opportunity of showing her the work of CIMPA, and I hope they could help in future schools in Morocco.

Also, during the school, the call for projects of CIMPA Research Schools for 2019 was posted. The organizers kindly gave me the opportunity of presenting ths call for projects to the participants, end encourage them to candidate. In fact, I could start some contacts with two groups (one in Morocco and one in Argelia), that are interested in presenting the candidature.

The final contribution of CIMPA was of 10580 €. It was used to pay the tickets for the financed students, the lodging and meals (contributing also to the whole bill of the meals of everybody), and the lodging of some speakers. The following table collects these data:

Tickets of the students	1250 €
Lodging of the students	30934.50 DH
Restauration	45600 DH
Lodging of speakers	22966.80 DH
Total	10580 €

FIGURE 5. CIMPA expenses

Moreover, we must add my travel expenses, that amount 204.53 €. Other contributions were obtained from International Mathematical Union, Académie Hassan II des Sciences et Techniques, ICIAM, Moulay Ismail University at Meknès, CNRST from Morocco, AUF and Versailles University. The total budget of the school was about 36000€, so the contribution of CIMPA represented around 30 % of the total. The precise budget will be detailed in the organizers' report.

Ifrane and Valladolid, May 2017.



FIGURE 6. Group picture