

**REPORT OF THE RESEARCH SCHOOL “COMBINATORIAL
COMMUTATIVE ALGEBRA”
LAHORE (PAKISTAN), MARCH 5–14, 2018**

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This Research School took place at COMSATS Institute of Information Technology in Lahore (Pakistan). I was only present there the first week. COMSATS (<https://lahore.comsats.edu.pk/>) is a rather new University in Pakistan, with 7 campuses and a total of around 40000 students. Lahore campus has 6000 students. It is focused in scientific and technological areas. Lahore campus is located in a green and peaceful area, quite far from Lahore center.

The school begun on March 5th, with the opening ceremony. The people who spoke were

- Prof. Dr. Arshad Saleem Bhatti, Dean of Sciences CIIT Islamabad.
- Prof. Dr. Jorge Mozo Fernández, representing CIMPA.
- Prof. Dr. Sarfraz Ahmad, from the Mathematics Department of COMSATS, as the main organizer.
- Prof. Volkmar Welker, as the President of the Scientific Committee, and representing the speakers.
- Laura Mayoral Aguilera, Spanish Consul, representing the Spanish Embassy in Pakistan.
- Prof. Dr. Moiz ud Din Khan, Chairman of the Department of Mathematics, CIIT Islamabad.
- Prof. Dr. Asad Ullah Khan, Chairman Department of Chemical Engineering, CIIT Lahore.
- Prof. Dr. A. D. Raza Choudhary, ex Director General Abdus Salam School of Mathematical Sciences, GCU Lahore.

I personally would like to thank specially the presence of the Spanish Embassy in Pakistan, represented by the Consul, Mrs. Laura Mayoral.

The scheduled courses of this School were:

1. Volkmar Welker (Germany): Orthogonal Representation of Graphs, Combinatorics and Algebra.
2. Tim Römer (Germany): Lattice Polytopes.
3. Sara Saeedi Madani (Iran): Binomial Edge Ideals.
4. Santiago Zarzuela Armengou (Spain): Computing Local Cohomology.
5. Nguyen Dang Hop (Vietnam): Powers and Symbolic powers of ideals.
6. Rashid Zaare-Nahandi (Iran): Ideals with Linear Quotients and the Simon Conjecture.

In the original project there were 7 courses scheduled. Prof. Jürgen Herzog, one of the main contributors to the school and to the mathematics in Pakistan, couldn't come due to health issues, and he was replaced by Prof. Hop. Also, Prof. Martina Juhnke-Kubitzke couldn't come, also for last-minute health reasons and was replaced by R. Zaare-Nahandi, from Iran. Finally, Uwe Nagel, from USA, didn't come due to recommendation of his Embassy. So, the final number

of courses was 6. All these changes were done transparently by the Scientific Committee. Also, the external coordinator, Marc Chardin, unfortunately didn't come by personal and professional reasons, but he sent a message apologizing.



FIGURE 1. Same buildings at COMSATS

ing about them, and asking him to be responsible if anything they could do (!!). He had to fulfil many documents related with these students. I must say that the organizers made everything possible to help them. I suggest that in some of these extreme and regrettable cases, CIMPA contacts previously the embassies sending information about the event and about the students, perhaps it could help them. Political issues must never stop the development of science.

The courses took place in a conference room of the Science Faculty, that was equipped with a whiteboard and a projector. It had a perfect size for the number of students. The mornings were dedicated to the main lectures by the speakers, and the afternoons, they scheduled tutorial sessions, conducted by the speakers, and short presentations from the students (at least eight). Lunch was taken at University, in an adapted space, under a big tent, close to the conference room. The atmosphere was great. All the speakers made a great communication effort, both in the morning lectures and in the afternoon tutorials, that were appreciated by the students, who actively participated.

On Wednesday afternoon, a visit to an Army museum was organized. Regrettably, both Indian and Iranian people were not allowed to go there (at least Indian nationals have some restrictions in their visas, and they cannot go to military places) and they could not profit to this visit. I must say that this situation was uncomfortable for me, but this visit was scheduled rather in advance and the organizers were not aware of this problem, so they are not at all responsible for it. On Friday afternoon a visit to attend the Wahga Border ceremony was organized (and everybody could come), and another visit to the historical places of Lahore was organized on Sunday, but I was not there.

Foreign students were lodged in hotel "Pool & Park" (<https://poolandparkhotel.com/>) in town, and COMSATS had transportation from the hotel to the conference venue and return (distances in Lahore are always big). Some of the speakers (and me) were lodged in a Guest House inside the University. Apparently it was the former house of the Chancellor, and now it

There were about 60 students coming from Pakistan, and 11 from abroad: India (3), Iran (1), Indonesia (2), China (1), Morocco (1), Malaysia (1), Vietnam (1) and Italy (1). Among them, 8 received partial or total funding from CIMPA, to cover either their travel costs, lodging and meals. I want to highlight that three Indian students came to the school. For Indian people it is extremely difficult to obtain a visa to visit Pakistan, and only people from Kashmir have some opportunity. These students had enormous difficulties for the travel, that they needed to do by taxi during several days, crossing the mountains through a very dangerous road. Moreover, the organizer received the visit of the police asking



FIGURE 2. Lecture of Volkmar Welker and tutorial session

receives visitors and guests. It was basic but correct. Plans for building a new guest house for visitors are under project.

I would like to honor the great work done by the main organizer, Prof. Sarfraz Ahmad. He was in charge of everything, and he did everything in precise, fast and efficient way. He is, definitively, a model of great organizer of these events. Of course, he was surrounded by an excellent team of efficient and kind collaborators who were in charge of all the practical things.

The final contribution of CIMPA was 9426.10 €. They were distributed as follows:

Tickets of the students	3525 €
Lodging of the students	365200 PKR (2662 €)
Restauration	328525 PKR (2412 €)
Travel ticket Prof. Hop	717.54 €
Travel ticket Prof. Römer (partial)	109.56 €
Total	9426.10 €

FIGURE 3. CIMPA expenses

Other contributions came from COMSATS Institute of Information Technology of Lahore (around 5000 € including the use of the university residences), Higher Education Comission of Pakistan (around 3000 €), International Mathematical Union (1500 €), ICTP (1000 €), and the Ministry of Economy of Spain through Project MTM2016-781-P (780 €). So, the contribution of CIMPA represented around 45 % of the total budget. Precise details will be given in the organizer's report.

To these quantities it is necessary to add my travel and visa expenses, that are 851.16 €.

Lahore and Valladolid, March 2018.