

German-Armenian Experiments

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'Magic Maga, Peter Porsche, Short Sona, Terrific Tim' - that's how German-Armenian socializing works among physicists! We, twelve students of physics of the University of Hamburg (UHH) toured the capital of Armenia from 29th of September to 4th of October 2019, accompanied by four professors and scientific assistants. The CANDLE institute and the Yerevan State University (YSU) had invited us to take part in a number of experiments at the AREAL particle accelerator. A total of 23 Armenian and German students were divided into eight mixed groups in order to work with various components of a modern particle accelerator. Besides scientific cooperation during the experiments, presentations and discussions, the agenda also included an opulent program of cultural and social activities.

The chemistry between the students was right from the very beginning of the meeting on the first day. An immediate memory when we think back to our time in Yerevan is our first joint bus ride. The Armenian students started to think about mnemonic tricks for their own and our names, so that not even one would be forgotten! And we joined in with pleasure. Within minutes names such as 'Peter Porsche' and 'Magic Maga' were brought into being and the ice was broken. While we started to chat the bus took us to the ancient monastery Geghard, which was built into the solid rocks of Caucasus in the 4th century. Our thirst of knowledge was satisfied with detailed explanations by our proud hosts. In order to not literally die of thirst we jointly refreshed ourselves at a spring of holy water sputtering from the rock face. Returning back to daylight after inflaming some candles we took our first group picture. The already great day was completed by a course of backing Lavash, workshops on traditional Armenian handcrafts and a joint dinner. Armenian and German habits and anecdotes created laughter at a glass of wine. But also private interests and dreams of the future were interminable topics of conversation. Here we realized how exceptional our trip would become, so that not a single moment ought to be undocumented. In the course of the week group photos would develop to become the absolute running gag. Still the 'hahaha, hehehe, hihihi' with which Prof. Vasili Tsakanov, director of the CANDLE institute, brought us into the mood to take a picture, resonates in our heads.

Just like the group photos the bus of the institute became our steady companion. On the second morning it took us to CANDLE for the first time. The gravity of being a physicist was about to start. Divided into two groups we were guided through the institute. Here we met the resident scientists who introduced their work area to us, explained particular components of the accelerator and further, ongoing projects. A

high power laser, a two-photon microscope and even a piece of outer space – a vacuum chamber at the outlet of the accelerator in which satellite technology can be tested – were presented. The pride of what has been reached here was sensible in the air and increased the anyway pleasant anticipation of getting started to experiment at an accelerator in person.

Shortly after the end of our tour we began working out basic questions of accelerator physics in eight smaller groups. How can an ultra-short particle beam be generated and accelerated? How can it be steered through the facility? How can it be measured and which kinds of radiation hazards are associated with the operation of an accelerator? To answer these questions each team was supervised by an expert of the particular area under investigation. Jointly we experimented at an operational accelerator – a privilege unthinkable in Germany. The peculiarity of our collaboration was even recognized by the Armenian TV. A camera team looked over the shoulders of experimenting groups and interviewed students and professors. It was apparent to everyone that the standards were high: within shortest time experiments had to be performed, documented and presented in an international setting. Our work culminated in a colloquium at which each team had to give a scientific presentation describing and explaining their findings. Not only the short time, but also the necessity to communicate in a foreign language was a great challenge for us. However, this challenge also persuaded us to carefully listen to and interact with each other. In many cases the preparation of the talks took a large part of the night. Yet many of us – Germans and Armenians – excelled not only our own expectations but also those of the professors and tutors. Within only one day talks were prepared which – according to the teaching staff – would not stand out in a negative way on an actual academic conference.

Subsequently to the colloquium our efforts were valued: with celebrating applause each one of us came forward. Professor Tsakanov handed over a certificate to the German students not without some personal and warm words for the future. Equally Professor Rossbach, initiator of the program on the German side, recognized the contributions of the Armenian students. In the following all the strain retained over the week unloaded in a little party at the premises of CANDLE. The staff of the institute already awaited us with a great buffet full of little specialties. We took the occasion to toast the week lying behind us, on new friendships and jointly mastered challenges. Melancholy spread out alongside with joy due to the forthcoming farewell of people taken to our hearts. Soon it was about time to take a last group picture with heavy hearts.

We would like to express our gratitude to everyone that enabled this exchange program. Special thanks are due to our professors and mentors who helped with

words and deeds. Finally, we would like to emphasize how cordially and incredibly hospitable we were received. It is hard to believe how much we have experienced within a single week. Not only did we learn how to work with an accelerator, but we also gained a deep insight into Armenian life and many intercontinental friendships.



German and Armenian students, professors and staff of the institute in front of the main entrance of the CANDLE institute.



Students examine the accelerator during a tour through CANDLE.



Visit of the monastery Geghard near Yerevan.