

# METAS sponsors Capacity Building in Metrology

*In July 2019 the BIPM and the Italian Physical Society were jointly running a Metrology Summer School «New frontiers for metrology: from biology and chemistry to quantum and data science» in Varenna (Italy). In this context, METAS sponsored a capacity-building program in conjunction with the BIPM, aiming to create opportunities for a limited number of participants from States that have emerging metrology systems.*

*The three award winners Rafidah Rosli, Julián Gigena and Jorge Pereira could combine their attendance at the Metrology School with a short placement at METAS. During their internship of several weeks, they received a dedicated training and pursued a specific metrology topic of interest. Each of the three scientists had the opportunity to shortly report hereafter about their experience at METAS.*

## RAFIDAH ROSLI

I started to work as a metrologist at National Metrology Institute of Malaysia (NMIM) in 2015 after having finished my bachelor's degree in Physics. I was assigned to be responsible for the Gauge Block Laboratory under the Length and Dimensional Group. The first time I knew about this capacity-building program was in 2016 and since then, I always hoped to be selected for this program and finally, I got this chance in 2019.

At METAS, I received a training in the laboratory Length, Nano and Microtechnology under the supervision of Felix Meli where I spent most of the time in gauge block laboratory with Daniel Hirschi. I learnt numerous calibration skills and best practices for gauge block measurement using interferometric and comparative method. We made comparison measurement on NMIM standard gauge blocks that I brought from Malaysia and discussed about what are the factors affecting the difference in the results, sources that contribute for the uncertainties and the improvement works that can be done. Furthermore, I also consulted Alain Küng on how to upgrade the TESA Automated

Gauge Block Interferometer using LabView to minimize the cost for the upgrades and other options that we might have. Other than that, as NMIM is going to build its own linear interferometric bench, I had a chance to study METAS 50 m interferometric tape measurement bench. We discussed about what are the factors that need to be considered when constructing it, how to perform intermediate check and calibration of the bench. During this period with support of METAS, I had the opportunity to participate at the Metrology Summer School in Varenna. The lectures covered various physical metrology fields and some topics explained about the role of BIPM and metrology at the worldwide scale. These topics are very important for me as a young metrologist. There was also a poster session where participants had the chance to present their work and the opportunity to discuss about topics of interest for them. Finally, I would like to thank METAS for giving me this precious opportunity to gain more knowledge and new experience. It was a good exposure for me to the global metrology community and I had a very fruitful time both at METAS, Switzerland and in Varenna, Italy.

*Thank you.*





**JULIÁN GIGENA**

I have a degree in Chemical Sciences. I graduated at the University of Buenos Aires. Nowadays, I am about to finish my PhD thesis, which is about biological chemistry, also at the mentioned University. Since 2005, I work at the Department of Chemistry Metrology of the National Institute of Industrial Technology INTI. My main tasks are the following ones: preparation of certified reference materials as well as preparation of samples for proficiency tests and, at last, determination of persistent organic compounds by chromatography.

During my journey, I have been participating in the International School of Physics «Enrico Fermi», located in Varenna, Italy, where different topics such as fundamentals of metrology, redefinition of the international system of units and metrology

applied to chemistry were addressed. I have to say that it was a great experience for me because I had the opportunity to learn more and to exchange knowledge with specialists and colleagues.

After the School, I went to the National Reference Laboratory for Polycyclic Aromatic Hydrocarbons (PAH) at METAS. In the institute, I was involved in a project whose objectives were to develop PAH measurement capabilities in food by gas chromatography, in order to improve our measurement capabilities and expand our scope in food matrices to disseminate traceability to field laboratories by means of proficiency tests and reference materials.

With the support of the team of professionals, I was able to carry out the determination of PAHs in Yerba Mate. The measurements were carried out by GC-MS/MS, using the isotopic dilution method validated by the laboratory. It was a great experience for me because until now I never had the opportunity to work with isotopic dilution neither with a GC-MS/MS.

During my stay we optimized the method for the Yerba Mate, discussing the advantages as well as the disadvantages of the methodology used. We carried out the quantification of the PAHs in the sample, and the results and the quality assurance controls were discussed. In addition, we worked on the calculation of uncertainty and on the traceability of the measurement to the SI. On the other side, we were able to compare two different pre-treatments of samples (clean up) and draw conclusions about their advantages and disadvantages.

During the training, I had the opportunity to meet nice, kind and wise people, full of passion for what they do, sharing their knowledge with me. I have nothing but words of gratitude for them. Thank you all for the opportunity you have given to me and for everything you have done for me before and during my stay. I hope to be able to continue working together.

## JORGE PEREIRA

I come from the Portuguese Institute for Quality IPQ, the national metrology institute of Portugal. As an academic background I have a degree in materials science and a master's degree in materials engineering. At IPQ, where I work since about 4 years, my functions are in the liquid properties field (density, viscosity, surface tension and rheological properties), having already given support in the volume and flow field. I had the great opportunity to be sponsored from METAS to attend the 2019 Varenna Metrology School promoted by the BIPM and the Italian Physical Society, followed by the METAS project aimed to support young metrologists from other NMIs.

After this wonderful course, I had the great opportunity to have a short placement of two weeks at METAS in the flow laboratory with Dr. Marc de Huu and Dr. Hugo Bissig who welcomed me with open arms and offered to accompany me during my stay.

**The scientific objectives proposed at this stage were divided into 3 parts:**

- 1 Prepare a non-newtonian sample by adding particles to a newtonian oil (with a dynamic viscosity approx. 5 mPa s);
- 2 Determine the flow curve of the prepared sample by means of a rheometer in order to describe the non-newtonian behavior;
- 3 Test the effect of a non-newtonian sample compared to a newtonian oil on the measurements results of a Coriolis flowmeter.

Those objectives were almost obtained. For the preparation of the non-newtonian liquid we basically used gelatine dissolved in water. From the rheological tests performed it was concluded that the gelatine added to the water made the liquid non-newtonian approximated to a pseudoplastic.

Regarding the results obtained by the flowmeters for this particular case, no difference was observed in the flow rate, as expected for the Coriolis measurement technique.

One of the objectives of this training was also to get involved in the field of milli- and micro-flow, taking advantage of the experience and equipment of METAS, one of the reference NMI in this area.

