Raman spectroscopy training course

University of Bologna, Italy
November 8 to 12, 2021
By Dr Frédéric Foucher from the CNRS, Orléans, France.
Organized by Dr Barbara Cavalazzi and Dr Paolo Garofalo from the University of Bologna, Italy.

Raman spectroscopy is a vibrational spectroscopy method used to detect and identify organic molecules and minerals. This versatile method is used in many domains, from biology the earth science. The possibility to miniaturize its components now permits to use it also for space exploration. The NASA rover Perseverance, exploring the surface of Mars since February 2021, is equipped with two Raman spectrometers (SuperCam and SHERLOC) and the future ESA-ROSCOSMOS ExoMars 2022 mission will have on-board the Raman Laser Spectrometer instrument. Raman spectroscopy is a key instrument for astrobiology to study ancient and active traces of life on Earth and to detect putative traces of life on Mars. Since the last decades, the method has strongly improved with the development of Raman microscopy imaging. Geological, (astro-)biological and chemical research institutes are now numerous to be equipped with one of these systems.

Recently, the University of Bologna in Italy, acquired a WITec Alpha 300 Raman microscope under the responsibility of Dr Barbara Cavalazzi from the *Astrobiologica and Geomicrobiologica Laboratory*. This system, freshly installed in the new Raman Laboratory at the *Dipartimento di Scienze Biologiche, Geologiche e Ambientali-BiGeA*, will be used to study materials of astrobiological interest as well as for more general geological and biological applications.

On the other hand, Dr Frédéric Foucher from the CNRS, Orléans, France, was one of the first researcher to use a WITec system in Europe. He is in charge of a WITec Alpha 500RA since January 2009. Now recognized as a specialist, he published several articles and book chapters on this technique during the last decade. The main objective of this Europlanet Expert Exchange project was thus to give the opportunity for Dr Frédéric Foucher to share his experience on the system and to provide training on theoretical and practical aspects of Raman micro-spectroscopy and imaging for the future users at the University of Bologna.

From November 8 to November 12, the programme was as follows:
Monday 8: Dr Frédéric Foucher travelled from Orléans to Bologna and visited of the *Astrobiologica and Geomicrobiologica* team and the new Raman Laboratory at the end of the afternoon.
Tuesday 9: From 9h00 to 12h00, Dr Frédéric Foucher gave a 3h lesson on the theory of Raman spectroscopy and imaging for 20 researchers, students and technicians. The afternoon was dedicated to the preparation of the practical training courses.
Wednesday 10 and Thursday 11: Dr Frédéric Foucher trained the participants to use the system during 3h training courses sessions, from 9h00 to 12h00 and from 14h00 to 17h00. The participants were split in four small groups to permit to all of them to work on the system.
Friday 12: From 9h00 to 12h00, Dr Frédéric Foucher gave a 3h lesson on data processing. He came back to Orléans in the afternoon.

Finally, this Europlanet Expert Exchange project was a success. Helped by the active announcement of Dr Barbara Cavalazzi, the training course was full. All the participants found the training course interesting and were very satisfied by the programme. This event was also a good opportunity to reinforced the interactions between the Exobiology group at the CNRS, Orléans and the Astrobiological and Geomicrobiological team at the University of Bologna. It is certain that this collaboration will continue in the future and it is probable that some of the students present at the event will come in Orléans in the framework of their Master or of their PhD thesis.