Photo credit: PuntoEdu

LVEM 5 User Profile: Dr. Betty Galarreta

We recently talked with **Dr. Betty Galarreta**, Associate Professor at the Chemistry Department at Pontificia Universidad Católica del Perú (PUCP) and coordinator of the Chemistry and Nanoplasmonics Research Group. Dr. Galarreta has been a user of the Delong LVEM 5 for a few years, and has won grants and published work related to the LVEM 5. One publication detects pathogens critical to protecting our food supply by using aptamer-coated gold nanoprisms to trap analytes for analysis by portable SERS instruments. The following interview has been edited for brevity and clarity.

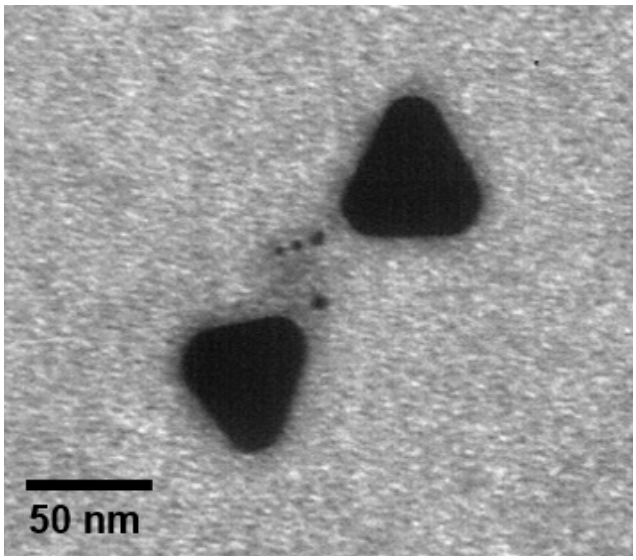
Hi Dr. Galarreta. I'm excited to learn more about you, your research, and how you've used the LVEM 5. To start, can you please tell our readers a little bit about yourself?

I am an Associate Professor at the Chemistry Department at Pontificia Universidad Católica del Perú (PUCP) and coordinator of the Chemistry and Nanoplasmonics Research Group. Our work mainly focuses on the synthesis, functionalization and characterization of nanoparticles that could be used in the development of accessible detection methods in the food industry, health, and environment, among others.

I heard you won a grant to help purchase this instrument, that sounds like a really inspiring grant source and story. Can you tell me about this grant, and what winning it has meant for your research?

In 2017, the Peruvian Ministry of Production had a call to purchase research equipment that could help strengthen the research facilities and the development of projects in the country. As a result, we got this grant to purchase an electron microscope that could help us consolidate the nanotechnology research in the country and that could be accessible to researchers in academia and industry (Grant

N°281-INNOVATEPERU-EC-2017). In our case, we required an electron microscope that could help us characterize the nanoparticles prepared in the lab. Before getting the LVEM 5, like many other researchers in the country, we had to send our samples abroad and with all the possible consequences this might have, including long waiting times, the possibility of decomposition of the sample and a limited number of samples that could be tested. Therefore, purchasing the LVEM 5 was of great help not only for our research but also for other local peers.



A new biosensor developed by Dr. Galarreta's group traps analytes between gold nanoprisms using apatmers, as confirmed by LVEM5 imagery. (Hernández, 2020)

Why did you choose to purchase a LVEM 5?

While we were looking for an electron microscope, we knew we wanted to get one that did not require complicated and expensive maintenance. We also wanted equipment that was able to resolve details within the 1-2 nm range and that we could use to analyze not only metallic nanoparticles but also some biopolymers. The LVEM 5 not only met our requirements but also made it possible to have sort of a 3 in 1 electron microscope, being able to characterize the same area in TEM, SEM and STEM mode.

What are your favorite things about the instrument, now that you've owned it for some time?

First, the possibility to easily characterize different materials and the same area with different modes at high resolution. It really shortens the amount of time we have to wait to get images from our nanostructures and other materials and, with that we could define the next steps in our protocols. Second, the possibility to characterize some biomaterials without adding any conductive coating that might affect the original topography. Third, the opportunity to teach our students how to use an electron microscope and they could grasp better some of the concepts they learn in class. Finally, the opportunity to collaborate with others and to grow our network.

You very recently published a paper titled "Development of a label-free-SERS gold nano-aptasensor for the accessible determination of ochratoxin A." (Hernández, 2020). Can you briefly describe that work, and how did the LVEM 5 help you in your research?

The goal of the project was to developed gold nanotriangles modified with oligonucleotides used as molecular probes of ochratoxin A, a toxin produced by fungi that could contaminate food at any stage and that has been associated to cancer, kidney and liver failure among other diseases. Once the sensing nanostructures are modified, we could use them as antennas to detect the presence of ochratoxin by analyzing the Raman spectra changes of the aptamers adsorbed on the surface of the nanotriangles. Thanks to the LVEM 5 we were able to characterize these nanostructures and to confirm the reproducibility of our chemically synthesized gold nanotriangle aptasensors.

What are other ways you utilize the LVEM 5 in your research?

We have used the equipment to help characterize animal and vegetable fibers, biopolymers developed for tissue healing, novel geopolymers, metallic organic frameworks, diatomaceous earth from local mining, and the development of isotropic and non-isotropic metal nanoparticles.

Where did you decide to place the instrument, presumably in your lab (as opposed to a core facility in a dedicated room)? How hard was site prep?

We have the LVEM 5 in our research lab in a room next to our wet chemistry lab. Site preparation was not too hard, we verified the power consumption, noise and AC system fulfill the requirements and we built a table to accommodate the microscope and the computer.

How many users in your group are trained on the LVEM 5? Is this a shared resource for other researchers at your institution?

We currently have 5 people fully trained. We provide access to the equipment to different groups inside and outside our department as well as to other universities and research and development facilities at local companies.

What is something you would like to say to someone considering purchasing an LVEM 5?

The LVEM 5 is an electron microscope that makes it possible to acquire images at high magnification in different modes. This is a good choice if you are looking for an equipment with accessible technical installation requirements and low maintenance. In addition, their technical support is very helpful and answers back in a short period of time.

That is wonderful advice! Thank you Dr. Galarreta for taking the time to share your stories about your exciting research and how the LVEM 5 is a powerful enabling tool.

References:

Hernández Y, Lagos LK, Galarreta BC. Development of a label-free-SERS gold nanoaptasensor for the accessible determination of ochratoxin A. Sensing and Bio-Sensing Research. 2020 Jun 1;28:100331.

About the author:

Robert I. MacCuspie, Ph.D., has over twenty years of experience in nanotechnology and materials characterization. Career highlights include leading the team that developed the silver nanoparticle reference materials at the National Institute of Standards and Technology, the first faculty and Director of Nanotechnology and Multifunctional Materials Program at Florida Polytechnic University, and over five years of consulting at the business-science interface from MacCuspie Innovations, helping companies commercialize and educate on technologies to improve human health.