Regional

Chemist breaks with the usual stereotypes

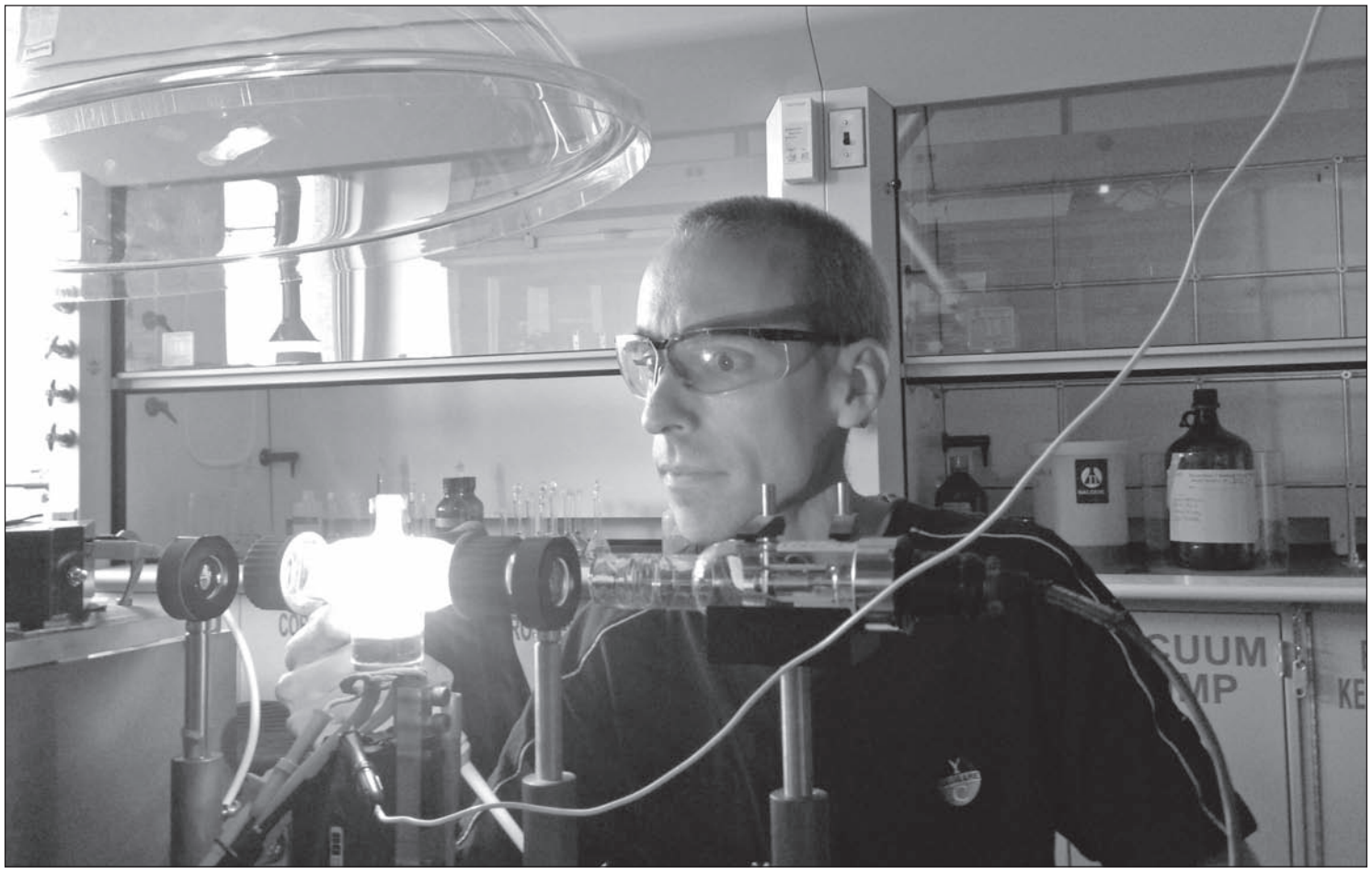

Photo by Sabrina Trupia

Professor Ed Navarre at his lab.

The popular image of chemists is one that usually involves white lab coats and solitary work on obscure subjects. This impression could not be further from the truth for chemists like Ed Navarre, an assistant professor in the department of chemistry at Southern Illinois University Edwardsville. A native of Edgewood, Md., he obtained his bachelor's in chemistry from McDaniel College in Maryland, and his doctorate in chemistry from the University of Vermont. Navarre's work involves much fieldwork, and focuses on trying to prevent damage to the environment and to human health. One technique he often uses is called atomic absorption, and despite its exotic name is very commonly used in chemical analysis.

"The idea is to take some sample of a material you are interested in and turn it into a gas," explained Navarre. "Once you create a little cloud of the atoms of the material in the gas phase, they can absorb light at very specific wavelengths. So we shine light on it from a source that generates element-specific wavelengths and they absorb them in proportion to their concentration. Then we can make some nice quantitative measurements that are very specific element by element across the periodic table." This technique was developed by the German chemist Robert Bunsen in the 19th century. He also invented the burner named after him and that is a common feature in any chemistry lab. Although this is a very lab-oriented technique, Navarre has been able to apply it to conditions in the field.

"I have been working on an atomic absorption instrument that is built around a light bulb filament as a heater. So instead of a flame or some large other source it's just a low wattage filament," he said. "We have been fairly successful with that." In fact, he carries all of the parts of this apparatus in a portable suitcase. "The idea behind that is that it could be powered with a lot less energy than a laboratory type instrument so you could take it to the field or if it were in a laboratory it would be less expensive and smaller." For chemists like him, an immediate application of this approach is to go to the field and analyze any toxins that can harm both the environment and humans.

"We still do a lot of blood-lead testing," Navarre said. "I believe all children in Illinois who live in a house over 40 years old are required to have a blood-lead test by the time they reach second grade. And we still find children with excessively high levels. Cadmium poisoning is much less common, but in certain fields it appears."

In addition to children, adults also may be affected by these kinds of environmental poisons. "In foundry workers it's a major issue," Navarre said. "We have even been contacted by the Illinois EPA in order to try and bring my instrument up to a point where they could do regular monitoring of their workers who are at superfund sites." Although this apparatus is not inexpensive, with prices between $5,000 and $10,000, Navarre believes that as demand increases, prices will become lower. By making the apparatus portable he and his colleagues are making it simpler and less expensive, without sacrificing the quality of results.

"We are able to hit detection limits that are very comparable to the large commercial equipment," he said. "Our sacrifices are in the breadth of analysis. A full-scale piece of commercial equipment of this kind we often say can analyze anything. What I'm working on, it cannot analyze everything, but it has some niche areas where it's very good. And if we use it in those areas, then it can give detection limits that are appropriate. Physiological sample is one area where this particular instrument excels." One of the major sources of environmental pollution by metals these days is from the by-products of electronics, which we dispose of more and more, particularly in developing countries.

Aldemaro Romero Jr.
College Talk

"The elements that I am working with actually are found there," he said. "Lead is there because it is used in the solder, and in a lot of the metal components of electronics. It becomes ubiquitous and problematic. The nickel and cadmium in the batteries that some of the electronics run on, if they're opened and destroyed leech out into the world. I have chosen those elements specifically because I've thought to myself, 'What are the industrial elements that we are leaking out into the world that are poisoning us?'" said Navarre. As anyone who has come up with a new scientific instrument, he is facing new challenges for which his career as a chemist did not prepare him.

"I did not get into science and chemistry and the field of atomic spectrometry for the purpose of being an instrument seller," he said. "That was never my intention. In some way I have always had a practical view on science that it's there to do something. And as it turns out the particular project that I have taken on has implications in environmental racism, international issues and a tremendous amount of other important issues."

Navarre keeps thinking about the future. When asked what is his next big project you can see the enthusiasm behind his words. "It's a project that I have wanted to start for a while. It is to finish assembling a device that stores energy in a large capacitor then discharges it suddenly through a wire winding and forms a transient plasma that vaporizes material directly from a solid to a gas phase." Such an apparatus would make the kind of chemical analyses he does even easier.

Aldemaro Romero Jr. is the Dean of the College of Arts and Sciences at Southern Illinois University Edwardsville. His show, "Segue," can be heard every Sunday morning at 9 a.m. on WSIE, 88.7 FM. He can be reached at College_Arts_Sciences@siue.edu.