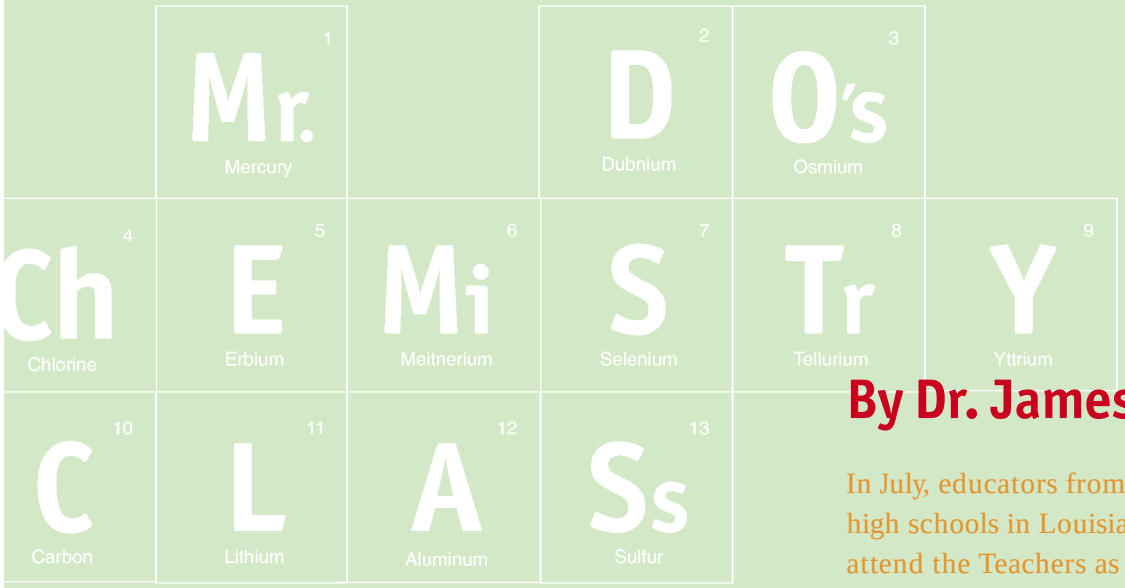

Mr. D Os Chemistry Class

By Dr. James Louviere

In July, educators from middle schools and high schools in Louisiana and Texas will attend the Teachers as Leaders 2003 Summer Academy on UL Lafayette's campus. "Chemistry Lab Activity Re-Design Using CBL Technology" will be led by Son Do, a UL Lafayette chemistry instructor. In this essay, Dr. James Louviere, a physics teacher at New Iberia High School in New Iberia, La., writes about his experience at last summer's academy. **Photo by Doug Dugas**

Son Q. Do's smile is infectious as he hands us test tubes and waves us toward glass bottles of clear liquid on a table.

I pour about two fingers of the silver nitrate solution into my test tube, then some potassium hydroxide solution. A small, fuzzy flat cloud, maybe as thick as nickel, forms where the two liquids meet.

With a plastic medicine dropper, I draw ammonia water from a beaker and begin dropping the smelly liquid into the mixture in my test tube. I know that, sooner or later, the liquid will cloud and turn murky brown. When that happens, I must shake the mixture so that any silver atoms released by the chemicals will cling to the walls of the test tube.

Nothing happens, although the test tube is nearly full. So I reach for the brown glass bottle of silver nitrate again and add a thimbleful.

A sudden darkening appears where I poured the last liquid in, then slowly moves downward. I screw a black plastic cap onto the test tube and shake it. A flash of silver brightens the part of the test tube nearest my thumb, and I think, "Heat from my hand must be making the silver cling there!"

I join three other science teachers who are heating their test tubes over a wide-mouth gas burner. "Wow!" one of them exclaims.

"Look at that!" another adds, as her test tube becomes totally silvered in just a heartbeat. "This is great."

Do smiles, apparently delighted by our excitement.

This class is made up of experienced teachers. The more senior teachers like me have been teaching for decades, but with Do, we find ourselves reacting like little kids. That's the kind of wonder he elicits from his students at the University of Louisiana at Lafayette.

In one short week, Do has covered the essential concepts of general chemistry, linking them all to one core concept, the molecular nature of matter.

Do's 2002 Summer Academy for Teachers as Leaders is titled "Less Chemistry is More, Plus CBLs." It reverses the common practice, decried by many experts, of "spreading science a mile wide and an inch deep." Instead, he concentrates on only a handful of key concepts, teaching them intensely in laboratory exercises so they have a chance to sink in and change the way we handle our science teaching.

Not only do we conduct several kinds of experiments each day, covering the gas law, the structure of atoms and effects of atomic structure on chemical activity, we gather a great deal of data using electronic probes that measure the conduction of light through various concentrations of a colored solution, air pressure at various temperatures, and the electrical potential between metals in electrolytes.

Do's week-long "academy" began on a Monday. By Thursday, we held in our hands ordinary Florence flasks, stoppered, perhaps 10 percent full of colored water. As we held them, the water began to boil, due to the heat of our hands. This led right into a laboratory exercise covering the behavior of "ideal gases" at various temperatures and pressures.

That afternoon, in another spell-binding activity, Do heated three scoops of white powder (potassium chlorate) in a test tube. When he dropped a Life Saver® candy into it, it flared like a rocket and shot out brilliant white fire for perhaps 20 seconds or more.

"That's the reaction of sugar and oxygen that goes on in your body, only much more slowly, as you burn calo-

ries. Like metabolism, it produces heat energy, and carbon dioxide and water," Do said. "This was about 10 calories. The average person's diet contains over 2,000 calories. That's a lot of energy!"

A major feature of the academy was the extensive use, in nearly every activity, of "CBL" technology, which stands for "computer-based laboratories." It uses a sophisticated scientific calculator and a digital interface to take samples of heat, light, pressure, acidity and voltage from chemicals as they are reacting. These battery-powered devices are small enough to roll up in a magazine, but powerful enough to emulate desktop computers. When linked to a printer, they convert long, precise tables of data into "hard copy" graphs.

These small marvels are available for less than half the cost of a modest personal computer. More and more high schools are distributing them to science classes and some colleges are requiring students to purchase them to use in their studies.

"I don't let my (university undergraduate) students use the CBLs to draw their graphs, but we use them to gather data as an experiment is performed," Do said. "I think the students learn more by making graphs with regular graph paper at this stage. Later, they can print them out with the computer. Then they will understand what the computer is doing, and they will know how humans and the digital world handle data.

"Without this, they will not really see what all that data means, and how they have to interpret what the computer-generated graphs are really saying."

Son Q. Do is a man with a mission. Not only will he help science teachers teach better, but he will go to their schools and spend a day delivering exciting science "shows" for students.

"One principal told me, 'I don't think this will work, but I'll let you try it.' Then, when I was finished with my presentation, having performed for over an hour to a hushed crowd, he said, 'Man, these kids loved it! That's never happened before!' " Do said.

"It's not me. It's the chemicals themselves. I just let them react, and the kids watch it. I pass these things around. I have students hold them and shake them. Then I put the chemicals on a table, and as I talk, they change color, or expand, or react. That's what keeps the kids fascinated. I don't try to explain anything. I want them to think, 'Why did that happen?' That's how they really learn, when they try to construct their own explanation of how things happen."

It's not all altruism, of course. Do knows he'll have a lot more success if the students enter the university with a good grounding in oxidation, reduction, balancing equations, using CBL technology and problem solving. He's only too glad to know that fewer teachers will be forcing rote learning on students, and more will be teaching the scientific way of knowing. More kids will be familiar with the "methods of science" instead of being able to recite "the Scientific Method" found in some colorfully illustrated but superficial textbook.

Do plans to publish a book that will contain his exciting, intriguing, and profoundly affecting presentations and explorations. You can bet it will not be full of blank spaces, colorful cartoons, photos, and artwork. It will be chemistry. It will be pithy. It will be solidly scientific.

"It's not me they'll love. It's the chemicals," he predicts.

It will be Son Q. Do's masterpiece, elegant and eloquent in its simplicity and profundity. It will be, in the tradition of Zen and T'ao, "Less = MORE, with CBLs." ■

Son Q. Do, a UL Lafayette chemistry instructor, shows students how chemicals can react. From left, are, seated: Christine Harrington; standing, Dustin Richard, Valerie Thompson, Dorothy Nguyen and Claudia Ramos.