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ONLINE

Online Spectrometry Lab Will Let Undergraduates Try Out Costly Equipment

A mass spectrometer is a complicated and expensive piece of equipment -- so complicated and so expensive, in fact, that most undergraduate chemistry students never get a chance to use one.

Now professors at Carnegie Mellon University and the University of Pittsburgh have developed what they call a Virtual Mass Spectrometry Laboratory. It gives students who wouldn't otherwise have access to the bricks-and-mortar version of such a lab a chance to experience how the equipment works (<http://mass-spec.chem.cmu.edu/testvmsl/general/default0.htm>).

Spectrometers allow chemists to study the composition of such compounds as proteins and polymers. The equipment can read a molecule's "fingerprint," from which chemists can identify it. Spectrometers are sensitive enough to identify traces of a substance found in blood, urine, or hair.

The virtual lab lets students practice with the same kind of technology in four online case studies. In one, they try determining whether cocaine is found in a lock of someone's hair. In another, they must identify -- from blood samples -- the animals participating in a futuristic "Olympics" whose contestants represent various species.

Mark E. Bier, director of the Center for Molecular Analysis at Carnegie Mellon, helped develop the virtual lab. He wanted students to be able to customize their experiments by controlling variables -- using different types of acid to attempt to break down a substance, for example, or changing the temperature at which a substance is tested.

Experiments that would normally take days can be completed in hours, he says.

Students can adjust the virtual equipment to focus on specific aspects of any test -- with the potential for inaccurate results.

"You can go down a lot of different paths and come up with slightly different answers, just like in the real world," Mr. Bier says. "We want the students to be able to make mistakes."

The virtual lab's creators included data representing a variety of substances that can be tested, as well as a wide range of machine settings. Each test can be tweaked by the student, resulting in thousands of possible outcomes.

While real spectrometers can cost about \$1-million, the virtual mass-spectrometry lab was put together with \$425,000 of grant money from the National Science Foundation.

The project is still being fine-tuned, and Mr. Bier hopes to have the virtual lab finished by the fall. He expects small colleges that don't have spectrometry equipment to use the online version, at no charge.

He also plans to have his undergraduate chemistry students use the online spectrometry lab as a learning supplement. "They will have a much better understanding about what it takes to solve a case study," he says. "We're picking real-life problems that we think will generate interest."

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