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Virtual surgical device a big sell for medical students

Business First of Columbus - by [Scott Rawdon](#) For Business First

A new surgical simulator developed by physicians and researchers at Nationwide Children's Hospital, **Ohio State University's** Department of Otolaryngology and the **Ohio Supercomputer Center** has the allure of a high-end video game.

That mean's it's not just an efficient training device, but a tool to recruit new medical students studying ear, nose and throat disorders.

Called the Virtual Temporal Bone Project, it accurately depicts what doctors will encounter while performing ear surgery.

"You can't do 3-D anatomy with books," said Dinah Wan, a second-year Ohio State University medical student who used the simulator during the summer. "It's very good for learning the anatomy."

The simulator displays a 3-D image of a temporal bone, which is located on the side of the skull near the ear canal and contains the structures for hearing and balance.

The simulator features a virtual drill physically similar to what a surgeon would use in an operating room.

The advantage is the student can try a procedure repeatedly without endangering the life of a patient or wasting precious cadaver material, which is in short supply at some medical schools.

Don Stredney, a research scientist in biomedical applications at the Ohio Supercomputer Center, is one of the project's lead investigators.

"This is research, not a product," he said.

Possibly most importantly, he said, the simulator saves precious time for busy students and faculty.

"A student may only have 15 or 20 minutes of free time to practice," Stredney said. It's not nearly enough time to prepare a lab experiment, but a student can simulate all or part of a procedure, he said.

Otologic disease accounts for more than \$8 billion in health-care costs annually in the United States, according to the bone project's proposal seeking funding from the **National Institute on Deafness and Communication Disorders**. Training the health professional charged with treatment of this significant disease process requires five to seven years at an annual cost of more than \$76,000, the proposal said.



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Don Stredney, a research scientist at the Ohio Supercomputer Center, helped develop the Virtual Temporal Bone Project. It lets students feel what it's like to drill at bone material during ear surgery and allows for repeated procedures without wasting cadaver material.

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The simulator's hardware costs about \$6,500; its software is open source because it is a publicly funded project.

As a recruitment tool, Wan said it captures young people's attention.

"We had a lot of high school students come in and try it," she said. "They thought it was cool."

Laura Matrka, a third year resident in the OSU Department of Otolaryngology, said presenting an easier way to illustrate complex temporal bone anatomy goes a long way in recruiting new medical students.

"We're all comfortable with playing video games and this is a much easier sell for residents just getting comfortable with the temporal bone," she said.

But it's not all fun and games. Matrka said from an academic or teaching standpoint the simulator has definite advantages to practicing on cadaver bones in a laboratory.

The simulator, development of which was funded through a **National Institutes of Health** program, can highlight any specific structure of the temporal bone and then drill away the bone material surrounding that structure.

When drilling cadaver bones, Matrka said, there's no way to drill into the bone and then back out, or easily turn the bone while drilling it to view the structure from all angles to ensure the correct bone is being drilled.

"The simulator is excellent for this aspect of learning to drill," she said.

While there's no substitute for using a real drill on a real bone for developing the feel needed in surgery, the simulator, she said, "is a good place to start before drilling cadaver bones."

The simulator's realism prepares students for entering a cadaver lab and not wasting specimens.

Gregory Wiet, a pediatric otolaryngologist, head and neck surgeon with Nationwide Children's Hospital and one of the project's lead investigators, said the simulator is cost effective.

While OSU has plenty of donated cadaver material, he said smaller universities may need to pay up to \$250 per bone specimen.

"There are no do-overs with real bone," said Wiet, who noted training can become very expensive, very quickly.

The simulator also reduces lab maintenance costs and once the simulator is built, he said, it has no significant maintenance cost.

According to press release from the Woburn, Mass. based **SensAble Technologies Inc.**, the simulator uses a SensAble Phantom haptic device, which allows a student to "feel" the surgery she is performing through the simulated drill, as well as see and hear it.

SensAble's device employs force-feedback technology, literally pushing back on the student's hand as she uses the controller.

Drilling sounds then are modulated based upon the pressures and area of bone being removed. The monitor's image replicates what a doctor sees through a microscope while performing surgery.

The simulator's realism and practical application won it the prestigious Dr. Frank H. Netter Award for Special Contributions to Medical Education from the **Vesalius Trust for Visual Communication** in Health Sciences during the annual meeting of the **Association of Medical Illustrators**, July 16-20, in Indianapolis.

Stredney said he'd like to use the simulator technology to pique the interests of kindergarten through high school students in learning anatomy. For younger users, he said the graphics could be more "cartoonish" and age appropriate while still conveying the same information.

"What is education if it's not a seed?" he said.

The graphics could remain more realistic for older students. Possibly a mobile unit could help smaller colleges of medicine that have a particularly difficult time obtaining cadaver material.

Stredney also envisions many veterinary uses for the simulator technology, which he believes could eventually reduce or eliminate the need to sacrifice animals for scientific experiments.

For now, Stredney said his crew is working to increase the simulator's usefulness by simulating bone dust from the drilling. He's also trying to find ways to enhance the simulated mitigation of blood during procedures, which requires an additional hand tool.

Regardless of how much fun it may be to operate, don't expect to find a Virtual Temporal Bone Project simulator in a gaming store any time soon.

"Our goal is to build a community to work with us," said Stredney. "We're not selling ours."

Project details

- Purpose: Creation of a computer-synthesized environment that emulates temporal bone dissection for training residents in otological surgical techniques and procedures
- Funding: National Institute on Deafness and Other Communication Disorders, one of the National Institutes of Health
- Amount: \$1.6 million for five years
- Duration: Aug. 1, 2004 - July 31, 2009
- Principal Investigator: Dr. Gregory Wiet, Nationwide Children's Hospital
- Lead participants: Nationwide Children's Hospital, Ohio State University, Ohio Supercomputer Center
- Other participants: Dozens nationally and internationally including University of Toronto, Cleveland Clinic Foundation, Harvard Medical School, Johns Hopkins University and Loyola University

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