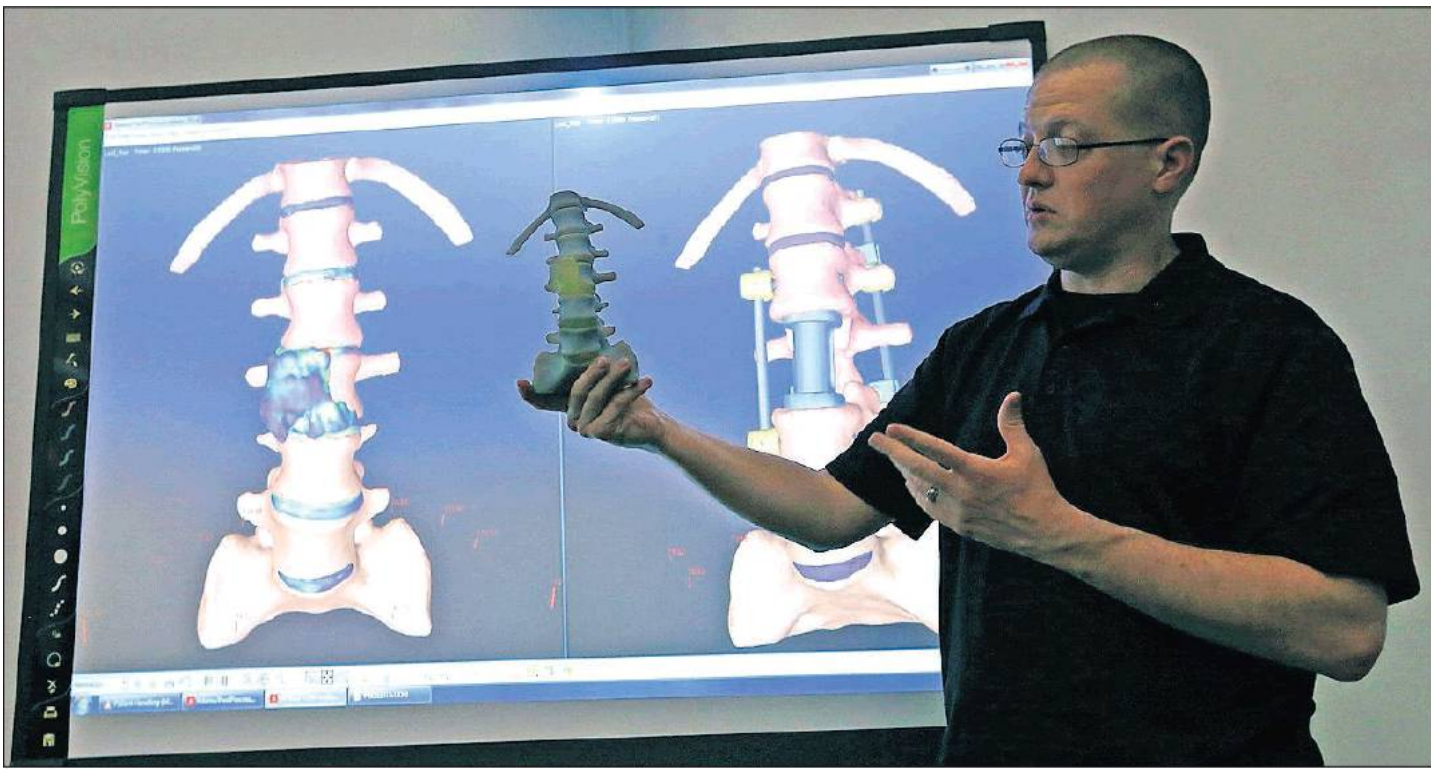
**OHIO STATE UNIVERSITY**

# Spinal engineering

## Expanding institute focuses on preventing, repairing back injuries

*By Lori Kurtzman The Columbus Dispatch*




Senior researcher Greg Knapik shows a model of a spine damaged by a tumor in the Spine Research Institute in the Baker building at Ohio State University. Behind him, the picture on the left shows the tumor while the photo on the right shows the repair. BROOKE LAVALLEY/DISPATCH PHOTOS

Doctoral student Peter Le pushes a beam around a room while being tracked by sensors.


In 1982, William S. Marras founded Ohio State University's Biodynamics Laboratory, which now serves as the core research engine for the Spine Research Institute. BROOKI LAVALLEY/DISPATCH

You don't have to be a spinal surgeon to know that what's going on behind Greg Knapik isn't good.

On a big screen is a simulation of someone's poor, gnarled spine, a tumor glommed onto a vertebra, chewing it into uselessness.

But to the right? A simulation of the same spine — this one with the repairs ultimately performed by a surgeon.

"The patient walked out cancer-free," said Knapik, a senior researcher at Ohio State University's Spine Research Institute.

Here on the fifth floor of the Baker Systems Engineering Building, science and medicine are merging in ways that might finally cut deep inroads into the complicated and frustrating world of spinal injury.

Back pain is a major problem in the United States, affecting some 80 percent of the population and costing more than $100 billion a year — on pa with the financial burden of cancer treatment.

Despite plentiful research, scientists and doctors still don't know exactly what makes the spine tick.

Spinal surgeries are successful about half the time, said the institute's executive director, Bill Marras. "It's a very complex part of the body," he said.

In that complexity, though, Marras sees opportunity. In 1982, he founded the university's Biodynamics Laboratory, which now serves as the core research engine for the Spine Research Institute.

Last week, the institute celebrated the grand opening of its new home on the Baker building's fifth floor. The move cost $750,000, allowed the addition of a few staff members and graduate students and more than tripled the space of the institute, which launched in 2012. The new digs include a huge lab in which 36 cameras can capture a subject's every move, the same kind of technology used to help animate lifelike creatures in movies such as "Avatar."

"It's all about understanding how people move," said research engineer Jon Dufour, watching doctoral student Peter Le push a beam with 41 reflective dots strapped to his body and monitors hooked to 10 muscles on his torso. "This gives us a very non-invasive view into his spine."

Information gathered in the lab is turned into the kind of biomechanical models that Knapik recently showed visitors to the institute. He played th animation of a man pushing a patient around the room, sensors tracking him, noting when that movement became problematic for his back.

The engineers want to understand both how the body moves and how those movements affect the spine. That information is particularly useful fo two groups: industries that rely on human labor and doctors trying to treat back pain.

Technology within the institute allows employers to see the force and movements that cause back injuries, and it gives surgeons the opportunity t virtually repair a spine before they ever touch a patient.

“We can quantify what makes a surgeon,” Knapik said. “Using our technology, we could take a poor surgeon and make them better.”

The university's work with Honda saved the automotive company untold money by reducing time lost to workplace injuries by 70 percent, Marras said. It's currently working on a study funded by the Ohio Bureau of Workers' Compensation to see the spine's limits on pushing and pulling varying amounts of weight.

“The best way to fix a (back) problem,” Marras said, “is never have it.”

But the institute's work is just as focused on those bad backs. On the surgery side of things, the institute is building a database of 60 spines so doctors can see how different models might respond to different procedures. Knapik said the hope is that science and engineering might help the medical field crack some of the spine's puzzles.

And on rare occasions, it can actually lift some of the blame from the maligned spine. In two cases, Marras said, engineers were able to determine that a patient's back problems had nothing to do with the spine at all. The real issue lay in the hips. Both spinal surgeries were canceled.
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