

A new \$6 million building devoted to research on how people move will give UNO ...



A leg up in biomechanics



KENT SIEVERS/THE WORLD-HERALD

Student Carlee Howe's movements on a split-track treadmill are recorded by a motion-capture system in the virtual reality lab at the University of Nebraska at Omaha. At top, Howe wears virtual reality glasses. The move to a new building will nearly triple the space for biomechanics research.

BY RICK RUGGLES WORLD-HERALD STAFF WRITER

Nick Stergiou and his colleagues have turned a field of study called biomechanics into a churning research machine at the University of Nebraska at Omaha. They've acquired grants, purchased devices and built their own technology to study falls, strokes, arterial disease, surgical performance and other phenomena. They'll be rewarded for their productivity this month when they move into a new, \$6 million biomechanics research building at UNO.

Stergiou and his crew will highlight their success by hosting up to 700 biomechanics scientists, physicians and others from around the country Sept. 4 through 7 for the annual American Society of Biomechanics meeting, much of which will take place at the CenturyLink Center. The official ribbon-cutting for UNO's biomechanics research facility will take place during that conference, on Sept. 5.

The 23,000-square-foot building

See Research: Page 2

Research: Team works with NASA on astronauts' balance problems

Continued from Page 1

will give the biomechanics researchers almost three times the space they currently have in UNO's Health, Physical Education and Recreation Building.

"As you can see, we're expanding, expanding, expanding," Stergiou said. "We've outgrown our place."

The lab focuses largely on the mechanics of movement, particularly walking and balance problems for people with various afflictions and challenges, such as the elderly and people who have had strokes. The researchers use virtual reality systems, infrared cameras, computer data collection, special treadmills, robotic gadgets and other devices to record, measure and improve performance. They work with the National Aeronautics and Space Administration on balance problems astronauts face when they return to Earth. And they've brought a National Football League kicker, former Husker Alex Henery, to their lab to analyze his technique.

The primary donation for the new building came from Ruth and Bill Scott, who have contributed heavily to the University of Nebraska Medical Center over the past several years. Ruth Scott said she heard Stergiou, 47, speak at an NU Foundation gathering in California 2½ years ago.

His words and deeds "almost ooze passion" for biomechanics, Ruth Scott said. "He's a dynamo, that's what he is."

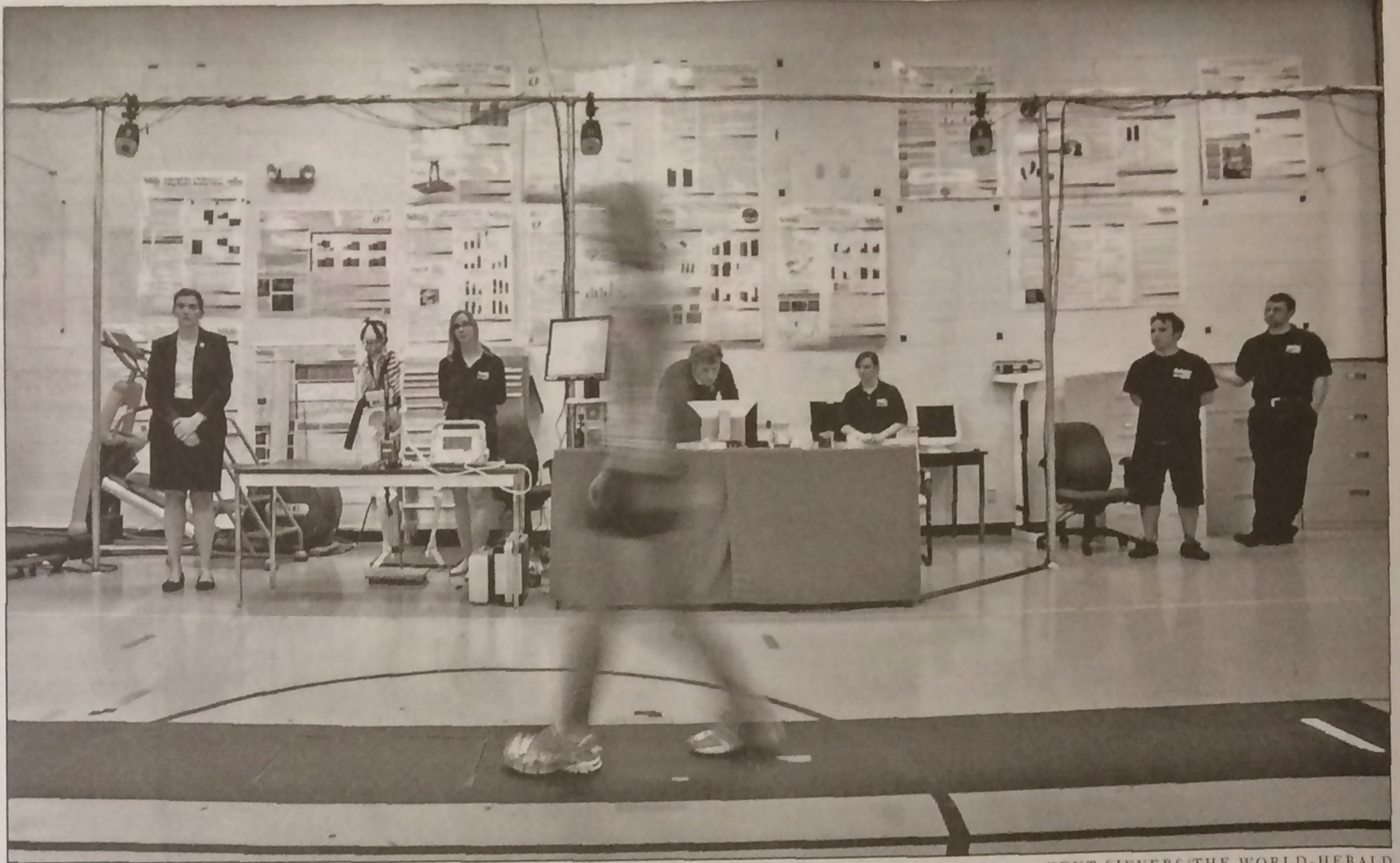
Stergiou, Mukul Mukherjee, Sara Myers and others in the biomechanics lab have generated close to \$15 million in research money from the National Institutes of Health, the National Science Foundation, the U.S. Department of Education, the American Heart Association, NASA and other groups.

Biomechanics is the study of the mechanics of biological processes and blends anatomy, biology, physics, mathematics and engineering. It's a comparatively new discipline. The American Society of Biomechanics was formed in 1977.

Years ago, Stergiou, who grew up in Greece, had a special interest in running shoes and athletic shoes. He came to UNO to get a master's degree because faculty member Kris Berg had written a paper related to the topic.

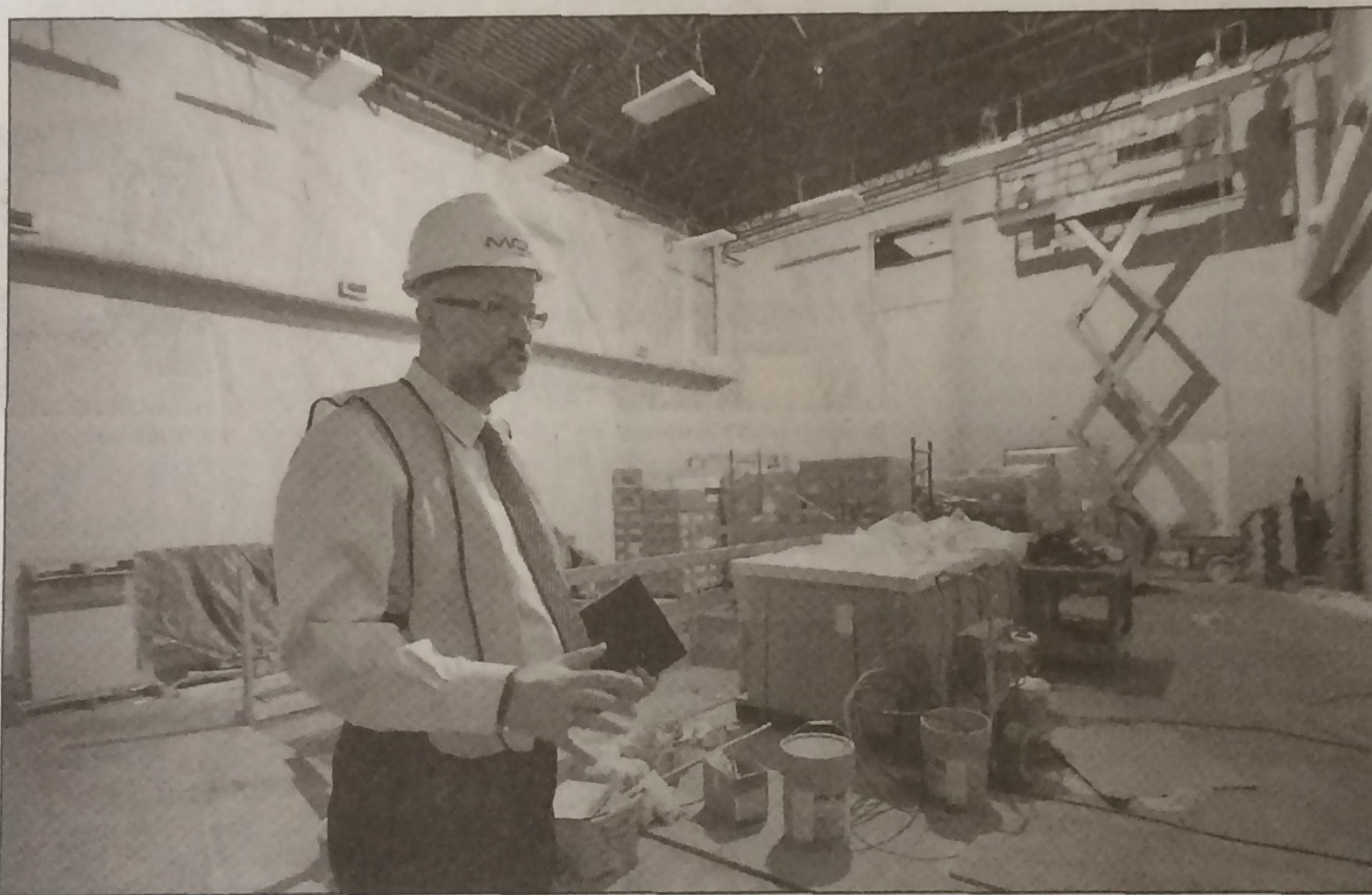
From UNO, Stergiou moved on to the University of Oregon, where his interests broadened to motor control, mathematics and other disciplines. He earned a doctorate in biomechanics at Oregon, and he joined UNO's faculty in 1996. He also has a faculty appointment at UNMC.

When he came to UNO as a faculty member, biomechanics research was confined to one room at the HPER Building, he said. Stergiou's research took off. And with the hiring of researchers such as Myers, a former UNO basketball player, and Mukherjee, a scientist raised in New Delhi, biomechanics research gobbled up classroom and office space on the second



KENT SIEVERS/THE WORLD-HERALD

In a gait analysis lab, 12 infrared cameras capture motion while a pressure sensitive mat records impact in an "active marker" motion-capture system.



KENT SIEVERS/THE WORLD-HERALD

Nick Stergiou surveys what will be the motion-capture room in a new laboratory facility being constructed for the Nebraska Biomechanics Core Facility at the University of Nebraska at Omaha. The biomechanics faculty and students, who study falls, strokes and arterial disease, are scheduled to move into the new facility this month.

floor of the HPER facility.

The researchers converted the faculty lounge into lab space, Stergiou said. They have about 20 research projects going now.

They are working with NASA to investigate whether insoles fitted with vibrating devices help astronauts regain their sense of balance after long space flights. They have developed a gadget that uses heel and toe sensors to distinguish problems in an elderly or afflicted person's stride, and thus measure the risk of falling.

Using infrared cameras, they study how arterial disease in the legs affects walking and

what treatment options are most beneficial. They have created robotic devices to test and improve stroke patients' arm use.

They use split-track treadmills to study the movements of stroke patients, examining data conveyed to a computer that show how hard the patient is striking the ground, where he's hitting the ground and what part of the leg is causing the problem. They have done walking assessments on amputees to help patients determine which prosthesis is best for them.

UNO biomechanics researchers have collaborated on projects with scientists and physicians from UNMC, Creighton

University and the University of Nebraska-Lincoln. From UNL, graduate student Chase Pfeifer and engineering faculty member Jeff Hawks brought former Husker and current Philadelphia Eagles kicker Henery to the lab to study his leg speed, technique and the precision with which he strikes the ball.

Creighton physical therapy faculty member Deborah Givens is working with the lab to refine her device, which measures the back reflexes in patients with lower back pain to test, among other things, the effectiveness of physical therapy.

Simulation at the lab has helped UNMC surgeons practice

WHAT IS BIOMECHANICS?

Biomechanics is the study of the mechanics of a living creature, including how a person moves and the way the heart beats. Over the past decade the University of Nebraska at Omaha has developed a buzzing biomechanics lab and will soon open a new building dedicated to biomechanics research.

Examples of UNO's diverse biomechanics research:

- » Scientists examine the link between breathing and walking in patients with lung disease.
- » Scientists study the biomechanical challenges that take place during stair climbing, with the intention of diminishing the elderly's risk of falling.
- » Researchers study whether music and controlled tempos can help people with Parkinson's disease and other maladies improve their stride and balance.
- » Researchers try to determine which prosthetic device fits an individual's walking pattern.

In short, biomechanics is a broad world of endeavor. Soon, UNO will have a facility that focuses solely on that world. — Rick Ruggles

their precision in robotic surgery and laparoscopic surgery.

The new building, which will be attached to the HPER facility by a third-floor walkway, will include various lab areas, changing rooms for research subjects and patients, meeting rooms, faculty offices, a machine shop for making and tweaking devices, and other features.

It will be UNO's first building dedicated to research and will house "a lean, mean research machine," Stergiou said.

"How fast we're going to outgrow that, I don't know."

Contact the writer: 402-444-1123, rickruggles@owh.com twitter.com/rickruggles