

# BUCKEYE ENGINEERING



Targeting the cause  
of low back pain



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

**INSIDE /** BREAKING BARRIERS  
COMMITTED TO CARING  
TIME AND CHANGE CAMPAIGN

# A novel therapy for back pain

Most adults have experienced low back pain, at least temporarily. But for some, the pain is constant and debilitating. In addition to affecting quality of life, chronic low back pain exerts a significant socioeconomic burden, primarily through lost work days and treatment costs. As many of its sufferers try to manage the pain with prescription drugs, it also has contributed to the growing opioid crisis.

Biomedical Engineering Professors Devina Purmessur and Natalia Higuita-Castro are leading an interdisciplinary Ohio State team to address an underlying cause of the pain, intervertebral disc degeneration. They received a one-year, \$368,000 National Institutes of Health award to investigate novel regenerative medicine therapies for low back pain.

According to Purmessur, most current surgical and non-surgical treatments focus on alleviating the pain. “That doesn’t fix the disease,” she explained. “You’re just treating the symptoms.”

The optimal therapy would target both structural restoration and pain reduction. Purmessur teamed with researchers Higuita-Castro and Daniel Gallego-Perez to see if they can take a diseased cell and reverse it back to its healthy state through tissue engineering.

Their approach could potentially revolutionize spine surgery by providing clinicians with the ability to deliver a minimally invasive and non-addictive treatment of the underlying disease mechanisms in the operating room.

“Our delivery system is unique,” Higuita-Castro said. “We are using extracellular vesicles we have engineered as nanocarriers to carry a cocktail of reprogramming factors directly to the diseased cells.”

Their cell reprogramming concept has already been proven in the lab. The NIH-funded project will serve to further validate the technology and quantify the effects of non-viral delivery of transcription factors.

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## Breaking down education barriers

When Jen Schlegel battled one health problem after another in college, many urged her to temper her career goals. But she refused to give up. As one of two recipients of the 2020 President's Prize, Schlegel will spend the next school year helping address technical barriers to success for the physically disabled.

The biomedical engineer will receive a \$50,000 living stipend and up to \$50,000 in startup funding through the President's Prize, the highest university recognition awarded to exceptional students committed to social change.

More than 40 million Americans—including Schlegel—have limited dexterity. Born premature with cerebral palsy, she has faced lifelong health problems. “My project is trying to solve the issue of, how do you do written work if you can’t hold a pencil? It became very personal because I lost my ability to hold a pencil a couple of years ago.”



Schlegel leads a team in developing a software/mobile application that facilitates the connection between ideas and written work. Handicom is a finger tap-based app with a built-in library, allowing for seamless transfer of homework, images, diagrams, equations and more. It's just one of the tools she is building to achieve her ultimate goal of becoming a physician and to help others with similar struggles.

“I would have been content with just being a Buckeye alumna. I never would have in a thousand years thought that I would have ended up being some kind of success story,” Schlegel said. “But every story of success that I have would not have been possible without the people that I have behind me.”

**READ MORE:** [go.osu.edu/be28b](https://go.osu.edu/be28b)

# Alum uses technology to help disabled Ohioans

When Ali Rahimi '14 and his family immigrated to the U.S. from Iran for a better life, he never dreamed he'd one day return the favor for Ohioans with disabilities.

The computer science engineer's plan to pursue a career in animation and game development changed after he met Patti Ruble, a social worker disabled at age 12 by polio, for a social science assignment.

When Ruble's in-home health care agency changed, Rahimi saw how staff and scheduling problems negatively impacted his friend's life. In 2011, he launched home health agency Ohio At Home to help her. It now has 30 clients and 85 employees, who are all Ohio State pre-health students.

After Ruble wanted more independence, Rahimi created a wheelchair-tracking device that can call for help. In 2015, he



launched Medforall, an assistive technology company. It provides care coordination software for agencies, plus remote support and assistive technologies to help individuals with disabilities be independent.

"I wanted to use my engineering to do something more challenging," said Rahimi, who sees opportunities for future expansion of the company's services. "We want to be able to help people get a

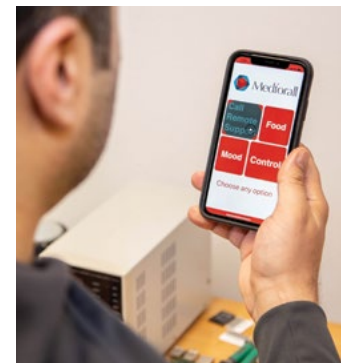
job, using augmented reality training and coaching. The same technology can be used for someone to go to school and have a remote tutor or coach."

Rahimi values Ohio State's role in the success of his businesses. Beyond hiring students and alumni, he has also sponsored several student capstone projects.

"We couldn't do it without Ohio State," he said. "Engaging Ohio State helped me develop that proof-of-

concept. It gave me faith that yes, this is doable. We can do it."

**READ MORE:**  
[go.osu.edu/be28c](https://go.osu.edu/be28c)



# Philanthropy campaign aims to engage 1M supporters

In October, The Ohio State University launched the public phase of *Time and Change: The Ohio State Campaign*, the most ambitious fundraising endeavor in the university's 150 years of making history.

The campaign strives to engage 1 million supporters, an unprecedented level in higher education. *Time and Change* has a financial goal of \$4.5 billion—also the largest in Ohio State's history—with three core areas of focus: student success; discovery; and healthy, vibrant communities.

In addition to continuous fundraising for undergrad scholarships and graduate fellowships, the College of Engineering will pursue three critical initiatives within the campaign's focus areas.

**Preparing Talent for Tomorrow:** To continue growth in a competitive global economy, the U.S. needs more work-ready engineers—from coding to manufacturing and every discipline in between.

**Making Mobility Smarter:** Ohio State's unique transportation research and testing assets position it well to lead development of autonomous, connected vehicles and mobility systems.

**Engineering Cures for Cancer:** Engineering and health sciences researchers are already collaborating in the fight against cancer. Their interdisciplinary successes to date indicate that more investment will lead to more breakthroughs.

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## Engineering new ways to battle cancer

A chemical engineering alumni couple's generosity is helping researchers engineer new ways to fight cancer, potentially transforming diagnosis and treatment of the disease.

A gift from Dean '62 and Kay Snider '63 supports the cancer-related research of three chemical engineering faculty, including Assistant Professor Eduardo Reátegui. He's analyzing cancer biomarkers to develop a liquid biopsy, a less invasive procedure that could eventually replace traditional methods.

"Instead of performing a tissue biopsy as you typically would for the detection of cancer or to test if therapy is working properly, a liquid biopsy is just a draw of blood or any other biofluid," explained Reátegui. "Because solid tumors are sometimes located in areas that are difficult to access, including brain or lung cancers, obtaining a tissue sample can be very invasive for the patient. You can probably do it once. However, with these approaches ... we can test cancer patients as frequently as we want."

Reátegui's team is working closely with Ohio State clinicians to validate the technology, with the ultimate goal of taking it from the lab bench to the bedside.

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# 150

1870  
2020

The Ohio State University is celebrating its 150th anniversary through spring 2020. Engineering has been included in the curriculum since the university opened. The College of Engineering was established in 1895. **VIEW MORE PHOTOS: [go.osu.edu/be28f](https://go.osu.edu/be28f)**

**1892**



**1910**



**1960**





## QUENCHING WATER NEEDS IN GAMBIA

In the village of Njau, water shortages during the dry season leave residents without water for days. By providing sustainable water access, Buckeye engineers hope to extend the community's growing season and increase their self-sufficiency.

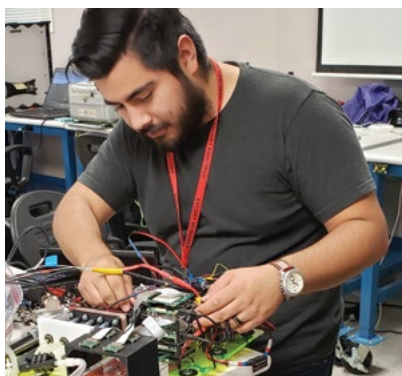


For the full scoop, visit  
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## COLLEGE RECOGNIZES ELITE ALUMNI

A renowned roboticist, a professor who is revolutionizing drug delivery and a former Olympian are among the 22 alumni honored at the 2019 Excellence in Engineering and Architecture Alumni Awards.



## GRAD HELPS OHIO STATE FLEX SPACE RESEARCH MUSCLES

Ohio State TV commercial star Wilson Flores '18 is part of an interdisciplinary university experiment funded by NASA to study muscle atrophy in space. It launched in December aboard Blue Origin's New Shepard rocket.

## MORE TREES PLEASE

New Ohio State research suggests that adding plants and trees to the landscapes near factories and other pollution sources could reduce air pollution by an average of 27% and may also be a cheaper option for cleaning the air.



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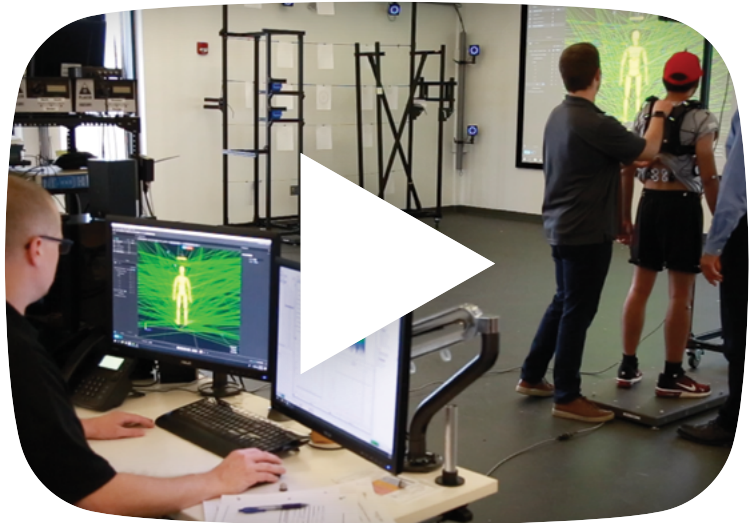
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