Washington University in St. Louis
School of Engineering & Applied Science

ENGINEER YOUR WAY

2018

January 16
First Day of Classes

February 18-24
National Engineers Week

March 12-16
Spring Break

April 13-15
Reunion at ThurtenE Carnival

April 26
Engineering Alumni
Achievement Awards

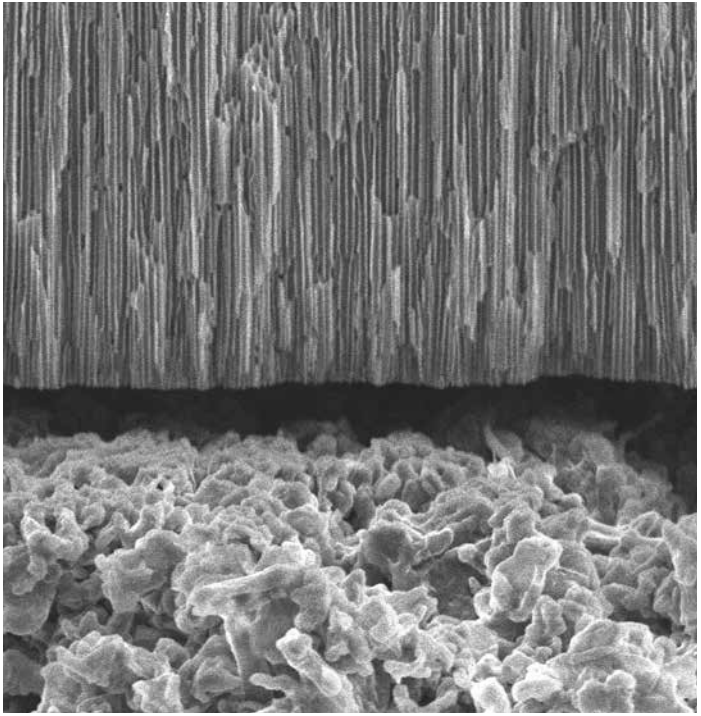
May 17-19
Reunion at Commencement

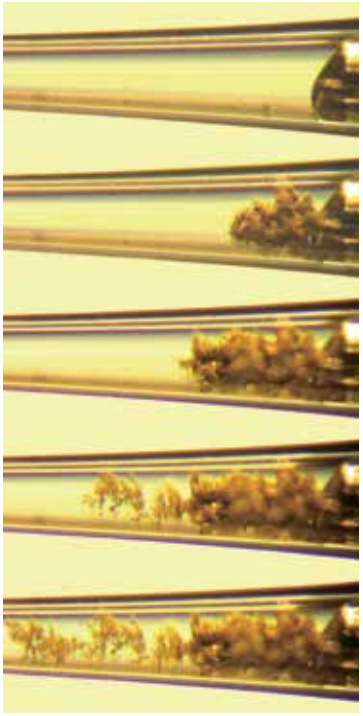
May 18
Commencement

August 27
First Day of Classes

October 13-16
Fall Break

engineering.wustl.edu





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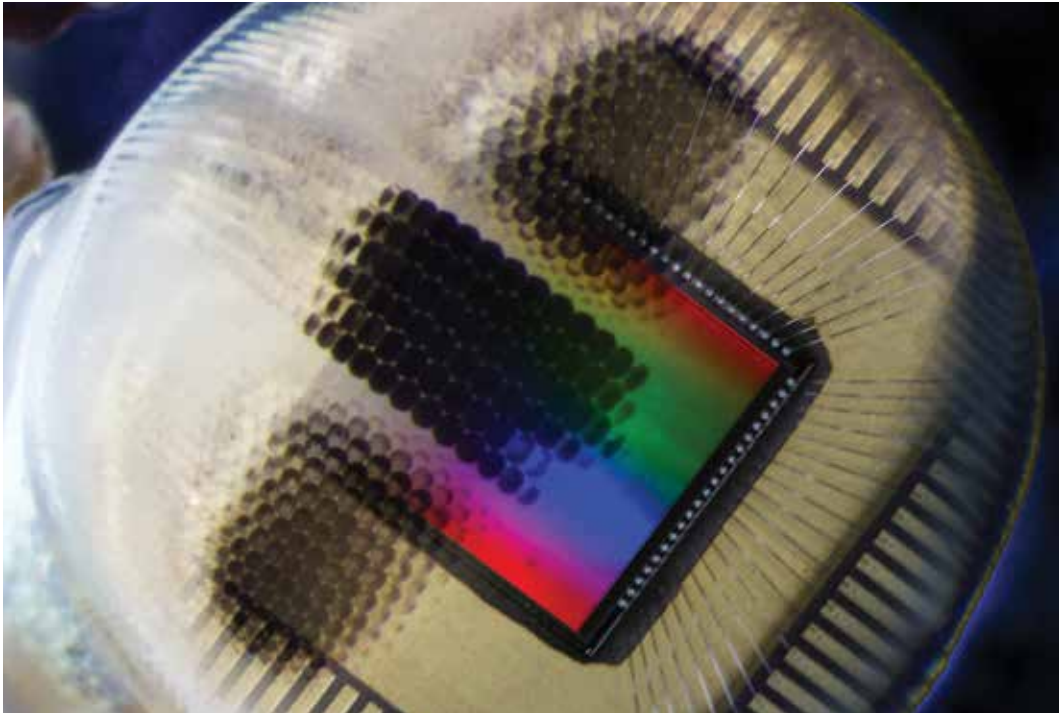
JANUARY

Peng Bai

Assistant Professor in the Department of Energy, Environmental & Chemical Engineering

Peng Bai's research focuses on developing next-generation batteries. Lithium metal anodes hold the promise to double the energy density of li-ion batteries by removing the volume occupied by graphite anodes. However, elusive growth mechanisms have been hindering the stabilization of lithium electrodeposition during recharging. By combining unique experiments in glass capillaries with theoretical analysis, a safety boundary — Sand's capacity — has been identified to guide the research and engineering of safe lithium metal anodes and high-energy rechargeable lithium metal batteries.

Right: The image shows the transition from root-growing whiskers into tip-growing dendrites during lithium electrodeposition in a micro glass capillary. Left: SEM images showing that root-growing lithium whiskers can be blocked by a nanoporous ceramic separator.



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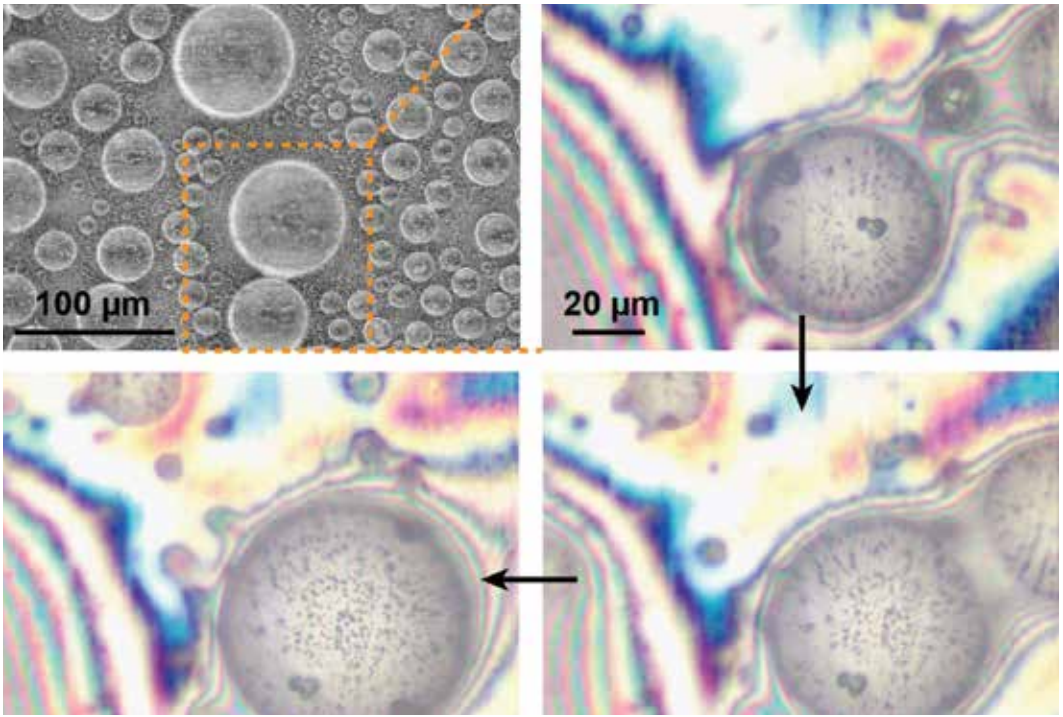
FEBRUARY

Missael Garcia Hernandez

Doctoral candidate in the Department of Computer Science & Engineering

Missael Hernandez was part of a research group that developed a novel bio-inspired, single-chip color-polarization camera that mimics the mantis shrimp eye. This is the first camera reported in the literature capable of capturing both color and polarization simultaneously. The picture is an abstract representation of the mantis shrimp eye blending in with an artificial eye or imaging sensor.



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MARCH

Patricia Weisensee

Assistant Professor in the Department of Mechanical Engineering & Materials Science

In the Thermal Fluids Research Group, Patricia Weisensee studies the interaction of liquids (mostly droplets) with various kinds of engineered surfaces. The image shows water droplets condensing on a porous substrate that is infused with a thin layer of lubricant (here: oil) to create an ultra-smooth, self-healing surface. Using optical microscopy and high-speed interferometry, the group studies the effect of microscopic lubricant deformations on the dynamics of water droplet coalescence and condensation heat transfer.

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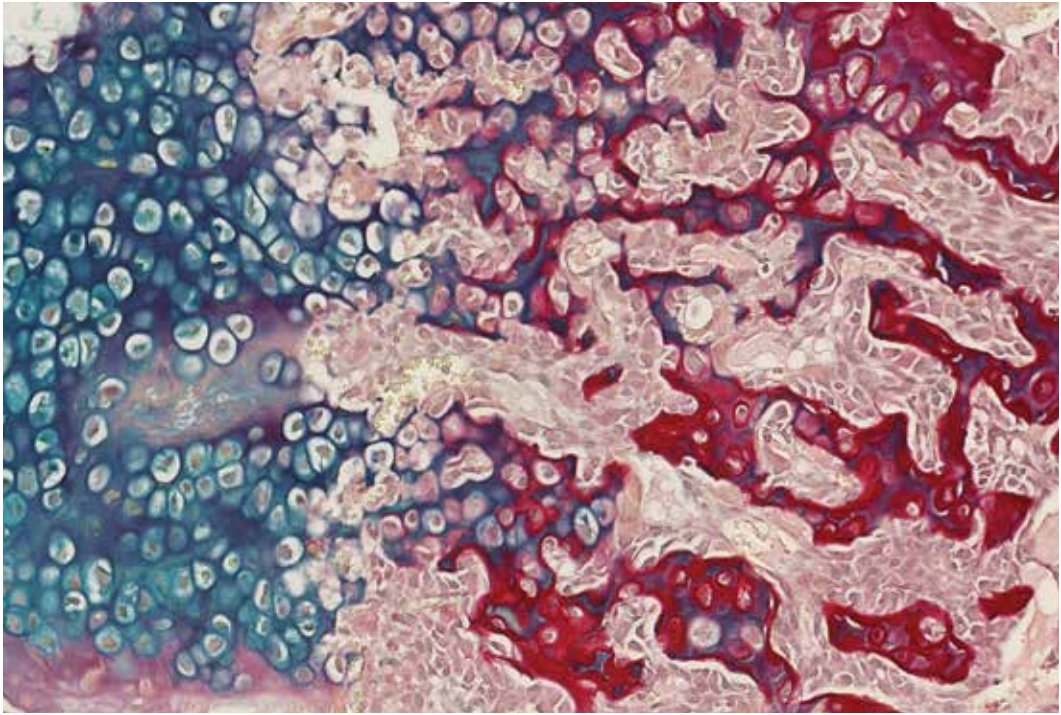
APRIL

From left: Andrew O'Sullivan, Matt Kollada, Meizhi Wang, Adith Jagadish Boloor and Will Luer

After about nine months of tinkering in the lab — and only a month's notice — a team of five Engineering students placed among the top 10 teams and won $750 in an international robotics competition in China for their low-cost autonomous vehicle design inspired by the movements of insects. Adith Jagadish Boloor, a master's student in robotics; Matt Kollada, who earned bachelor's degrees in systems science & engineering and finance in 2017; Will Luer, a master's student in computer science; Andrew O'Sullivan, a senior majoring in mechanical engineering; and Meizhi Wang, a BS/MS student in electrical engineering, comprised the team that traveled to Xi'an Jiaotong University in Xi'an, China, the first week of June 2017 for the Silk Road Robotics Innovations Competition.



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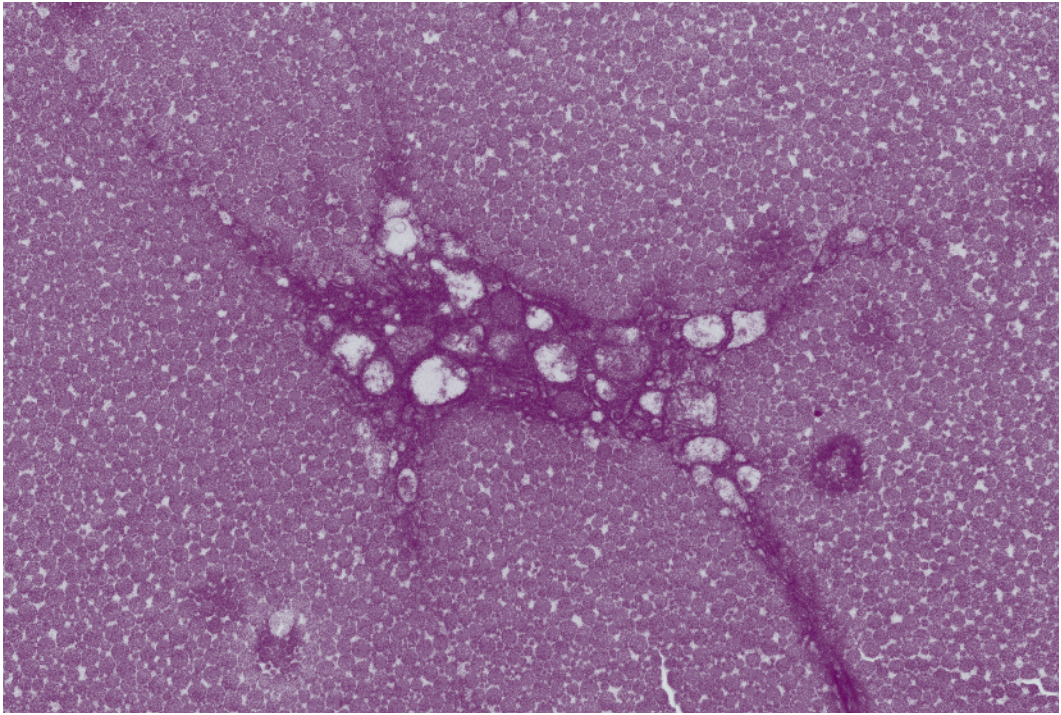
MAY

Evan Buettmann

Doctoral candidate in the Department of Biomedical Engineering

Evan Buettmann conducts research in Matthew J. Silva's laboratory in biomedical engineering and orthopaedic surgery in the School of Medicine. The image shows the osteochondral zone at day 14 of a healing femoral fracture where cartilage cells (blue stain) transition to osteoblast lineage cells (red stain). Buettmann is characterizing how loss of angiogenic molecules in osteoblast lineage cells (Osterix and Dentin Matrix Protein 1) and endothelial cells (Cadherin-5) affects bone repair.



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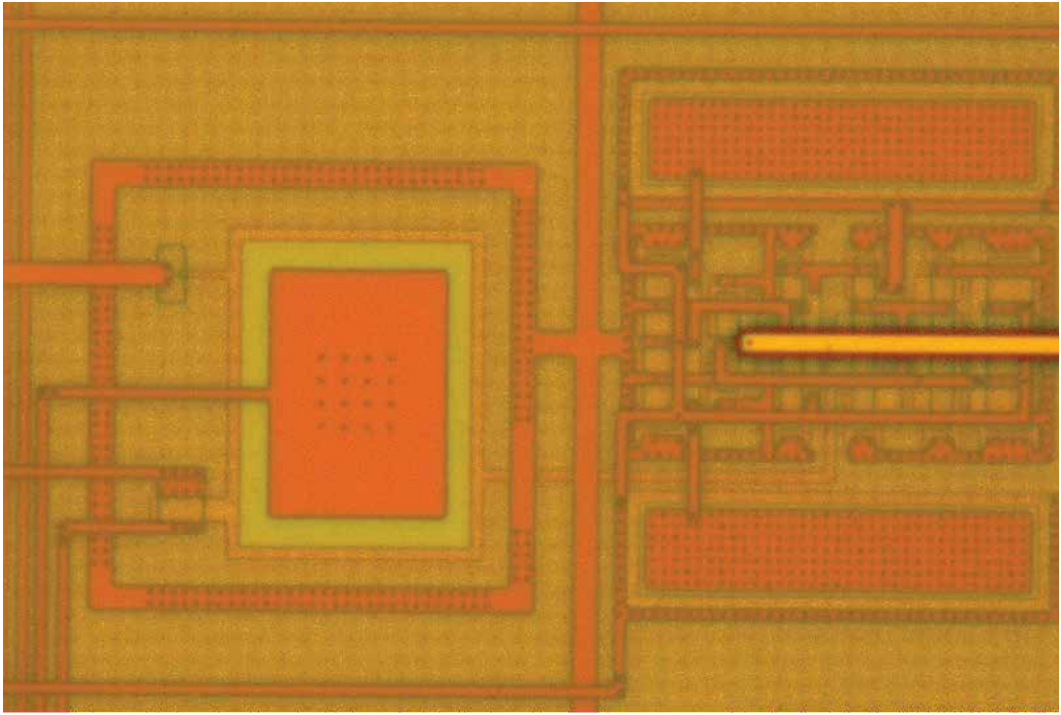
JUNE

Jeremy Eekhoff

Doctoral candidate in the Department of Biomedical Engineering

Jeremy Eekhoff's research investigates how elastic fibers contribute to structure-function relationships in tendons across multiple length scales. He works in Spencer Lake's lab in the Department of Mechanical Engineering & Materials Science.

The image shows a tendon cell surrounded by densely packed collagen fibrils. The tendon is viewed using transmission electron microscopy.



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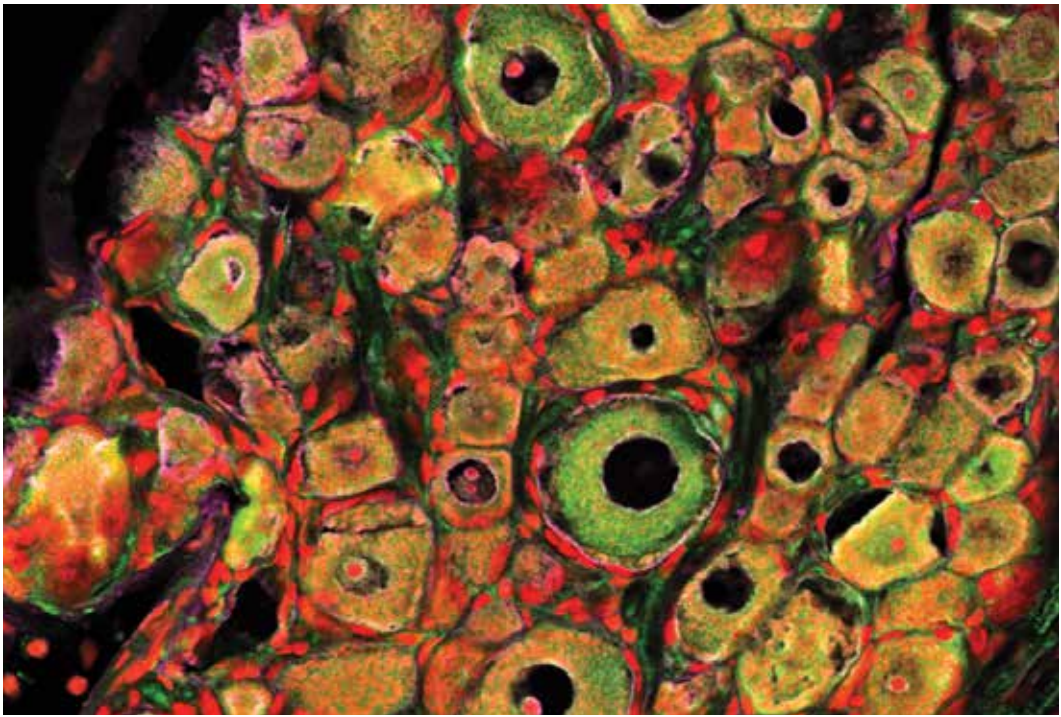
JULY

Shantanu Chakrabartty

Professor in the Department of Electrical & Systems Engineering

Shantanu Chakrabartty's research explores new frontiers in unconventional analog computing techniques using silicon and hybrid substrates. His objective is to approach fundamental limits of energy efficiency, sensing and resolution by exploiting computational and adaptation primitives inherent in the physics of devices, sensors and the underlying noise processes. Chakrabartty is using these novel techniques to design self-powered computing devices, analog processors and instrumentation with applications in biomedical and structural engineering.



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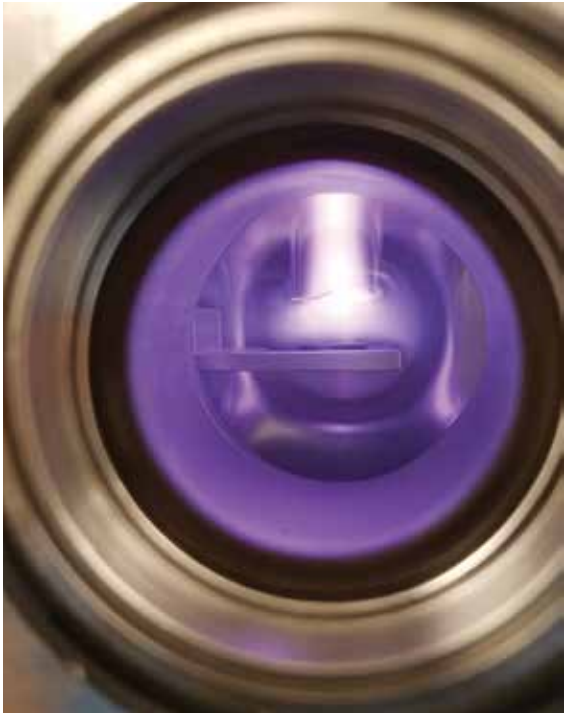
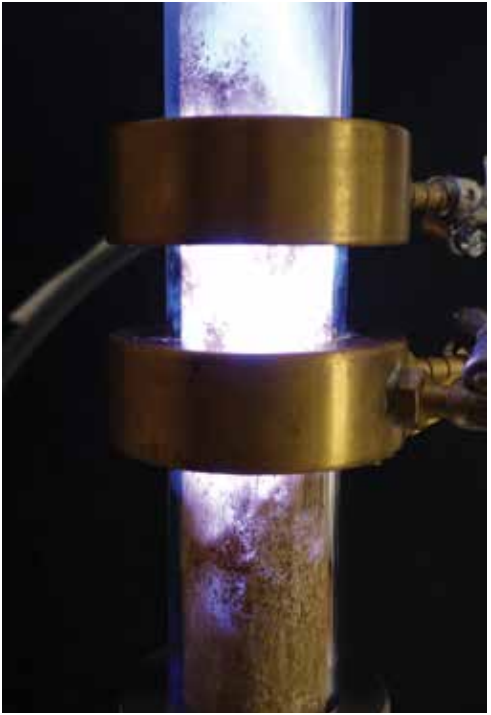
AUGUST

Elizabeth Leimer

Postdoctoral Research Associate in the Department of Biomedical Engineering

Growth of dorsal root ganglion nerve fibers into a degenerate intervertebral disc may be a source of low back pain. This tissue section shows dorsal root ganglion neurons from a painful disc degeneration model which have been stained for growth-associated protein 43 (GAP43; green), a marker of axonal growth. This research could lead to a better understanding of mechanisms involved in low back pain and identify novel targets for therapeutic intervention. PGP9.5 (purple), satellite cell nuclei (red).





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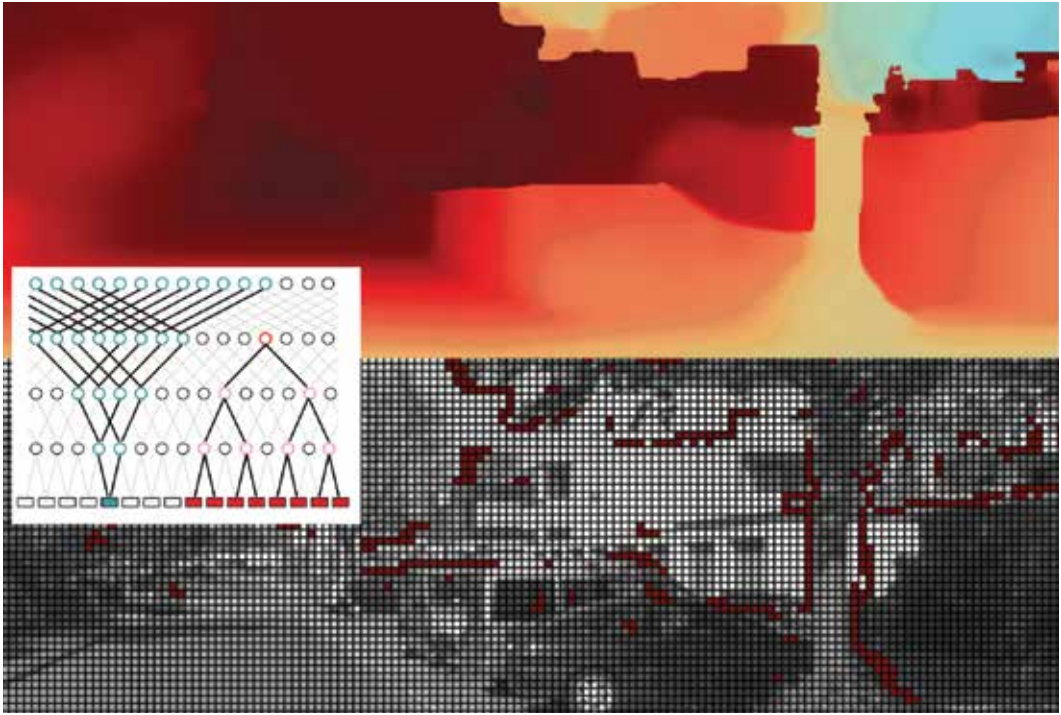
SEPTEMBER

Elijah Thimsen

Assistant Professor in the Department of Energy, Environmental & Chemical Engineering

The Interface Research Group led by Elijah Thimsen focuses on advanced gas-phase synthesis methods that operate very far away from local equilibrium, for example low-temperature plasma. Such methods are capable of creating beyond-equilibrium materials, which represent one of the greatest opportunities for synthesis science. Examples of applications currently being pursued in the Interface Research Group are: advanced lightweight aerospace composite materials, optoelectronic semiconductor nanostructures, analog low-power artificial intelligence, and high-energy-density fuel synthesis from renewable resources.

Left: Plasma treatment of an advanced aerospace composite.
Right: Plasma deconstruction of biomass.



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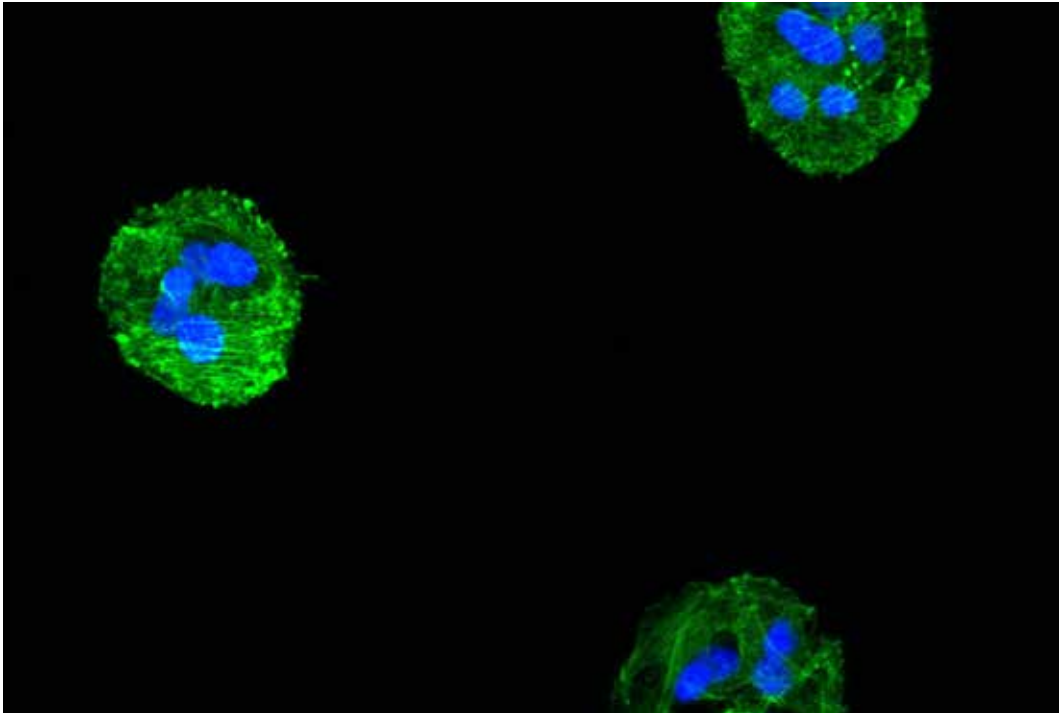
OCTOBER

Ayan Chakrabarti

Assistant Professor in the Department of Computer Science & Engineering

Ayan Chakrabarti works on problems in computer vision, computational photography, and machine learning dealing with the design of accurate and efficient algorithms for visual inference and of new kinds of high-capability sensors and cameras. His research aims to find solutions to these problems by considering the physics of image formation and the statistical structure of natural images and scenes.



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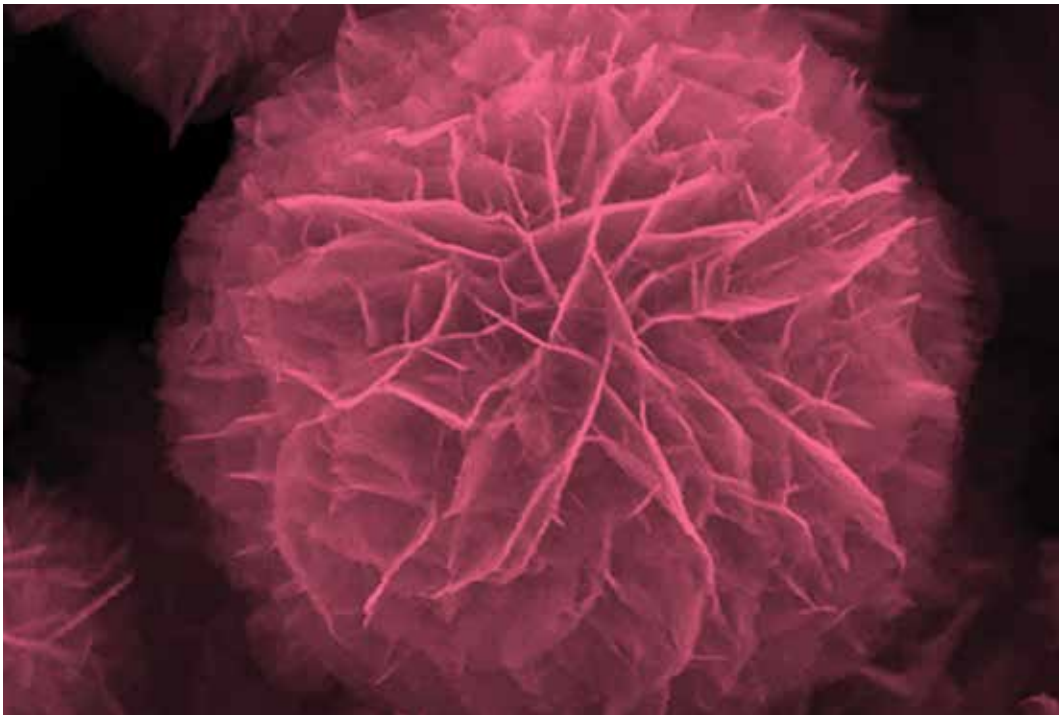
NOVEMBER

Julie Speer

Doctoral student in the Department of Biomedical Engineering

Julie Speer's research involves investigating a role for geometric confinement in controlling human intervertebral disc cell behaviors. Julie has been collaborating with Amit Pathak's lab in the Department of Mechanical Engineering & Materials Science on this project.

The image was taken by Speer and Liufang Jing, members of Lori Setton's lab in the Department of Biomedical Engineering, using scanning laser confocal microscopy. It shows human nucleus pulposus cells that have been cultured on soft gels patterned with large circles (blue is DAPI, a nuclear stain; the green is phalloidin staining for F-actin).



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DECEMBER

Shalinee Kavadiya

Doctoral student in the Department of Energy, Environmental & Chemical Engineering

The research conducted in the Aerosol and Air Quality Research lab includes synthesis of materials with electrical and optical properties to capture sunlight and convert it to usable energy. The image shows one such material, a flowerlike microsphere of copper indium disulfide ($CuInS_2$, CIS), synthesized in collaboration with a visiting scholar, Logu Thirumalaisamy, from India. CIS microspheres have high crystallinity and unique morphology for efficient light absorption in the solar devices.

CrystEngComm, 19, 6602, 2017.