ELON UNIVERSITY

VOICES OF DISCOVERY

2017-18

Elon College, the College of Arts and Sciences at Elon University is committed to engaging students and the community in the excitement and wonder of discovery. During the past two decades, scores of discoveries in molecular biology, atomic physics and computer technology have changed the face of science and brought dramatic changes to our world.

The Voices of Discovery speaker series brings to campus preeminent scientists and mathematicians who have left an indelible mark on the way we view the world. They share their remarkable experiences and perspectives with Elon students and the community. This series plays a fundamental role in the university's commitment to create a science-conscious community and to help students be informed citizens.

Voices of Discovery is just one element of Elon's efforts to provide outstanding science education. At the Dalton L. McMichael Sr. Science Center, students work in modern laboratories with cutting-edge research tools. They focus on discovery-based learning, undergraduate research and collaboration among the sciences, developing an appreciation for the scientific enterprise and how we acquire new knowledge.

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THE CHANGING LANDSCAPE OF CANCER

BAIRD LECTURE SERIES

Wednesday, **September 20, 2017** | McCrary Theatre | 7:30 p.m.

Dr. Siddhartha Mukherjee

Assistant Professor of Medicine, Columbia University Medical Center
Department of Medicine, Division of Hematology and Oncology
2011 Pulitzer Prize for Non-Fiction

The National Institutes of Health's National Cancer Institute projects nearly 40 percent of men and women will develop cancer at some point in their lifetimes, and estimates the national cost of cancer care in 2020 at nearly $125 billion.

Cancer is understood to be a collection of diseases characterized by genetic changes that enable cells to proliferate unchecked and potentially spread beyond the site of origin. While research suggests changes in a few key types of genes commonly promote the development of most cancers, it has also revealed that each person's cancer is genetically unique or individualized. As a result, former ways of classifying cancers and highly standardized therapies based on these classifications are now viewed as incomplete or imperfect. More diverse and individualized approaches to treatment, sometimes in concert with traditional methods, offer far more promise as effective therapies.

Precision medicine is the approach that uses more targeted therapies based on the unique genetic changes in a person's individualized cancer. This is the developing brave new world of the war on cancer, and the backdrop for Dr. Siddhartha Mukherjee's research. In a 2016 piece for the New York Times Magazine, the hematologist and oncologist, researcher, physician and author describes the "unleashing [of] a more experimental or even artisanal approach in oncology" that approaches "each patient as a unique problem to solve."

Mukherjee is a cancer researcher and physician at New York-Presbyterian Hospital/Columbia University Medical Center. His research focuses on blood cancers such as leukemias and lymphomas with the goal of developing targeted therapies. He is the author of the 2011 Pulitzer Prize-winning book, "The Emperor of All Maladies: A Biography of Cancer." He produced a second book in 2016, "The Gene: An Intimate History."

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REINVENTING THE TOILET

Monday, **November 13, 2017** | McCrary Theatre | 7:00 p.m.

Jeffrey Piascik

Senior Research Engineer
Research Triangle Institute

Did you know Nov. 19 is World Toilet Day? While toilets are an everyday resource for many, others throughout the world live without access to them. The purpose of World Toilet Day is to raise awareness of significant global health and development issues.

Current estimates show nearly one-third of the world's population still does not have access to effective, sanitary facilities, which is linked to disease, failure to thrive, premature death and a multitude of other social problems. A 2015 study reported in The Lancet Infectious Diseases journal found diarrhea is now the fourth leading cause of early childhood death.

Jeffrey Piascik, senior research engineer at RTI in the Research Triangle Park, is an expert in materials and testing technologies, including transformative technologies for water and sanitation health initiatives. He is part of a partnership with other engineers and social scientists at RTI, Duke University and Colorado State University working to develop and test an affordable toilet that safely sanitizes and recycles human waste without inputs of electricity, water or other infrastructure.

These toilet prototypes, which are currently in field testing, use an electrochemical disinfection process and convert human waste into burnable fuel, stored energy and disinfected, non-potable water through a biomass conversion unit. Research and development funding was chiefly through a Reinvent the Toilet challenge grant from the Bill and Melinda Gates Foundation.

Piascik is the lead systems integrator for the Reinvent the Toilet program at RTI. His areas of specialization include material science, micro-electro-mechanical systems technologies and modification of surfaces for enhanced properties. Prior to joining RTI International, Piascik was a software product manager and engineer for MTS Systems Corp. He has authored more than 50 peer-reviewed papers and conference proceedings and holds four U.S. patents related to novel material systems.

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PERSONALIZED MEDICINE: YOUR ORGANS ON A MICROCHIP

Monday, **February 19, 2018** | McCrary Theatre | 7:00 p.m.

Nancy Allbritton

Kenan Professor and Chair of the Joint Department of Biomedical Engineering at the University of North Carolina at Chapel Hill and North Carolina State University

The cost of developing a new pharmaceutical is several billion dollars, and FDA approval can take more than a decade. Consequently, there is much interest in a technology that miniaturizes key biological functions of tissues and organs.

Advances in technologies such as microfabrication and microfluidics are resulting in a proliferation of small, 3D arrays of cells and tissues that function in many ways like natural organs, or can be constructed to model diseased organs. Benefits of these models include their small size; capacity for manipulation, analysis and personalization; and potential to limit or eliminate the use of whole animal models. "Organs on a chip" currently in research or testing include lung, heart, blood vessels, blood brain barrier and intestine models.

In April 2017, Nancy Allbritton received the 2017 UNC Chapel Hill Inventor of the Year Award for her research resulting in technological advancements and commercialization in several areas including cell signaling and organ on a chip development. Allbritton was part of a team of researchers from the University of North Carolina at Chapel Hill and N.C. State University that was awarded a $5.3 million grant from the National Institutes of Health to develop "gut on a chip" technology the size of a dime. Potential applications of this technology include basic science and applications relative to microbiota, drug development and screening and more.

Allbritton's research interests include biomedical microdevices, pharmacoengineering, cell signaling and microfabicated systems. She uses a multidisciplinary approach to problem solving, bringing together ideas and technologies from biology, chemistry, physics and engineering. The founder of three companies, Allbritton currently has 12 patents stemming from her research, with nine more pending.

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RESTORING MOTOR FUNCTION IN AMPUTEES WITH SMART PROSTHETICS

Monday, **March 12, 2018** | McKinnon Hall 218 | 7:00 p.m.

Helen Huang

Professor of Biomedical Engineering, Joint Department of Biomedical Engineering at the University of North Carolina at Chapel Hill and North Carolina State University
Director of the Rehabilitation Engineering Center at North Carolina State University

While humans have long benefited from science and technologies that restore and augment missing, damaged or less-than-optimal body form and function, the pace of advance toward what some see as our bionic and possibly post-human future is now fast and furious. One of many areas of biomedical engineering that illustrates this pace is the development of prosthetic limbs.

The Amputee Coalition recently estimated there are more than 2 million amputees in the United States alone with about half attributed to consequences of vascular disease and about half to trauma including outcomes of warfare. There is a push in prosthetic limb development toward advanced robotics or smart prosthetics. These increasingly bionic prostheses make use of neural-machine interfaces, such as myoelectric sensors, which enable the prosthetic device to respond to patient intent and function more intuitively with more flexible, adaptable movement patterns and with greater safety.

As the director of the Rehabilitation Engineering Center at N.C. State University, Helen Huang's chief research interest is understanding and developing neural-machine interfaces for applications that include artificial limbs and human robot interactions. Huang's research has been supported by several federal agencies including the Department of Defense and the National Institutes of Health as well as private companies.

Significant recognition of Huang's work includes receipt of the Delsys Prize for Innovation in Electromyography and an NSF Faculty Early CAREER Award. Huang is passionate about sharing the excitement of science and promoting the development of young scientists. She is active in promoting STEM education and career opportunities to K-12 students with a focus on minorities, women and students with disabilities.