ELON UNIVERSITY

VOICES OF DISCOVERY

2023-24

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. Students work in modern laboratories with cutting-edge research tools at the Dalton L. McMichael Sr. Science Center, which is undergoing renovations to enhance facilities for biology, chemistry and environmental sciences. In fall 2022 engineering and physics moved to the new Innovation Quad, which is located adjacent to McMichael Science Center. Two of the buildings, Founders Hall and Innovation Hall, support teaching, project design and development, and research in physics and engineering and provide opportunities for cross-disciplinary projects within the natural sciences.

THE TRUE PURPOSE OF NUTRITION

Robert Lustig, M.D., M.S.L.

Professor Emeritus, Department of Pediatrics, Division of Endocrinology, and Member of the Institute for Health Policy Studies at the University of California, San Francisco

Tuesday, Sept. 19, 2023
McCrary Theatre | 7 p.m.

What do coronary heart disease, diabetes, high blood pressure, stroke, fatty liver disease, cancer, dementia and many other diseases have in common? Collectively termed metabolic syndrome, these major health issues now account for 75% of the U.S. health care budget. Each is thought to be linked to abnormal metabolism or metabolic reactions that take place in the mitochondria, the energy producing factories inside each of our cells.

Robert Lustig and other researchers and clinicians are very interested in understanding the role that nutrition plays in the development of metabolic syndrome and consequently in the development of increasingly common diseases that afflict humans today. This has led to the up-and-coming concept that "food is medicine." But Lustig disagrees — he states that "Food can be medicine, but it can also be poison." This realization has led Lustig and the World Economic Forum to state that "the true purpose of nutrition is metabolic health."

Lustig graduated from MIT, received his M.D. from Cornell University Medical College, and his Master of Studies in Law degree from the University of California College of the Law, San Francisco. As a neuroendocrinologist, Lustig's research and clinical focus has been in metabolism, obesity and nutrition. He has worked to change the focus of the medical profession away from obesity and toward metabolic health. He is a leader and strong advocate for encouraging the food industry to move away from heavy use of sugary and highly processed foods. His latest book, "Metabolical: The Lure and the Lies of Processed Food, Nutrition, and Modern Medicine" (2021), focuses on the connection of processed foods to metabolic pathways that lead to chronic health conditions. One premise of the book is that medicines don't treat the cause of chronic disease; they just treat symptoms. Lustig is the chief science officer of the nonprofit Eat REAL and serves on the advisory boards of the UC Davis Innovation Institute for Food and Health.

CITIZEN SCIENCE GAMES:

CREATING AND IMPROVING VIDEO GAMES THAT HELP SOLVE REAL-WORLD PROBLEMS

Seth Cooper
Associate Professor, Khoury College of Computer Sciences,
Northeastern University

Monday, Nov. 6, 2023
Lakeside Meeting Rooms | 7 p.m.

Crowdsourcing, citizen science and gamification all present a promising approach to solving complex problems in science. Serious questions or problems are gamified and made available to large groups of typically non-scientist players who enjoy the game while competitively and collaboratively working to solve a serious puzzle or propose best solutions to a problem. The combination of ingenuity of the many different game participants coupled with the speed and power of computers has revealed a power of problem solving that may surpass that of a brain or computer algorithm alone. The citizen science approach also functions to demystify science and generate interest and excitement in the scientific process of learning.

Imagine thousands of players using an online protein design game called "Foldit" to develop the best shape of a protein enzyme to block interactions of the coronavirus spike proteins responsible for attachment of the virus to human cells. High scoring or promising solutions from these protein folding games are eventually submitted to scientists for actual laboratory study testing. When several hundred thousand players discovered in a few weeks the correct structure of a monkey protease that plays a role in determining simian AIDS, their contribution received author credits in a 2011 paper in the journal "Nature Structural & Molecular Biology."

Seth Cooper is currently an associate professor in the Khoury College of Computer Sciences at Northeastern University. He was awarded a Ph.D. in computer science and engineering from the University of Washington. While there, Cooper worked as a creative director for the Center for Game Science and was co-creator of the scientific discovery game "Foldit." Cooper's dissertation focused on scientific discovery through video games and received the 2011 Association for Computing Machinery Doctoral Dissertation Award. His current research interests include scientific discovery games, crowdsourcing games, citizen science, using games as an approach for solving difficult problems and automated tools for assisting game design. Cooper also received a Google Faculty Research Award in 2015 and a National Science Foundation Career Award in 2017.

TREE RINGS AND THE PROMISE OF ENVIRONMENTAL CHANGE

Daniel Griffin, Ph.D.

Associate Professor in the Department of Geography, Environment & Society, University of Minnesota

Tuesday, March 12, 2024
McCrary Theatre | 7 p.m.

Trees form rings that record a history of their local environment. Researchers can read and interpret tree ring records with surprising sophistication and are constantly acquiring new insights about past episodes of fire, frost, floods and droughts. Tree ring data are also providing critical information for environmental managers attempting to sustainably steward water and forest resources in the face of our rapidly changing climate.

Daniel Griffin is a dendrochronologist, a scientist who studies tree ring characteristics over long periods of time. This can tell scientists not only how old a tree is, but also give insights about what the weather conditions were like during each year of that tree's life. Longterm tree ring chronologies developed by examining tree rings from old-growth forests can offer clues about what the climate in an area was like long before other types of measurements were recorded.

Griffin's paleoclimate work in California has shown that the recent drought, made more extreme by the heat of climate change, was unusual in the context of at least the last millennium. Comparing tree ring growth with similar growth rings or increments from similarly aged marine organisms, Griffin and colleagues have demonstrated the increasing influence of atmospheric changes over time on primary productivity or growth across different ecosystems. Griffin is also passionate about using dendrochronology for conserving ecologically significant old-growth forests.

A signature project in Griffin's lab aims to bring the beauty and usefulness of tree-ring wood anatomy to the world for enjoyment and study. He and his team are developing new technologies for high-resolution imaging of entire collections of wood specimens with the intention to provide open-science opportunities for data sharing.

Griffin believes tree rings may be the most inherently accessible gateway for understanding environmental systems in terms of climate-related changes and a basis for taking appropriate actions to reduce harmful outcomes.

Griffin's current research is supported by grants from the National Science Foundation and the United States Geological Survey. He previously held research fellowships through the National Oceanic and Atmospheric Administration, the Environmental Protection Agency and the Woods Hole Oceanographic Institution.

THE KNEE BONE IS CONNECTED TO THE … IMPLANT!

ENGINEERING TREATMENTS FOR DISEASED JOINTS

Scott Arthur Banks, Ph.D.

Professor in the Department of Mechanical & Aerospace Engineering; Director of the Gary J. Miller, Ph.D. Orthopaedic Biomechanics Laboratory; Affiliate Professor of the J. Crayton Pruitt Family Department of Biomedical Engineering; Affiliate Professor in the Department of Orthopaedics and Sports Medicine, University of Florida

Thursday, April 18, 2024
Lakeside Meeting Rooms | 7 p.m.

The Centers for Disease Control estimates that at least 1 in 4 people in the United States has some form of diagnosed arthritis, which represents truly significant personal and social burden in this country. So what does engineering have to do with a big problem like osteoarthritis? Scott Banks would say, "a lot." In the world of studying and providing effective treatments for conditions like osteoarthritis, biomedical engineers apply basic science and mathematics to solve health-related problems through basic research and in designing, modeling and testing new technologies in collaboration with clinical practitioners, their patients and medical device companies.

Banks has been active in orthopaedic and joint mechanics research his entire career, during which he has designed joint replacement implants that have been used in more than 200,000 patients. His research has also focused on contributing to new technologies for quantifying musculoskeletal biomechanics, improving musculoskeletal modeling for surgical planning and treatment design, and developing advanced techniques for robotic image guided surgeries and research. Banks holds numerous medical device patents and collaborates with several medical device companies. He is credited with developing the first quantitative technique for direct measurement of 3D knee replacement motions while patients perform dynamic weight-bearing activities.

Banks is a member of several professional societies including the American Society for Mechanical Engineers, the Knee Society and the Orthopaedic Research Society. He served as president and annual conference host for the International Society for Technology in Arthroplasty in 2013 and remains active in several society organizing roles.