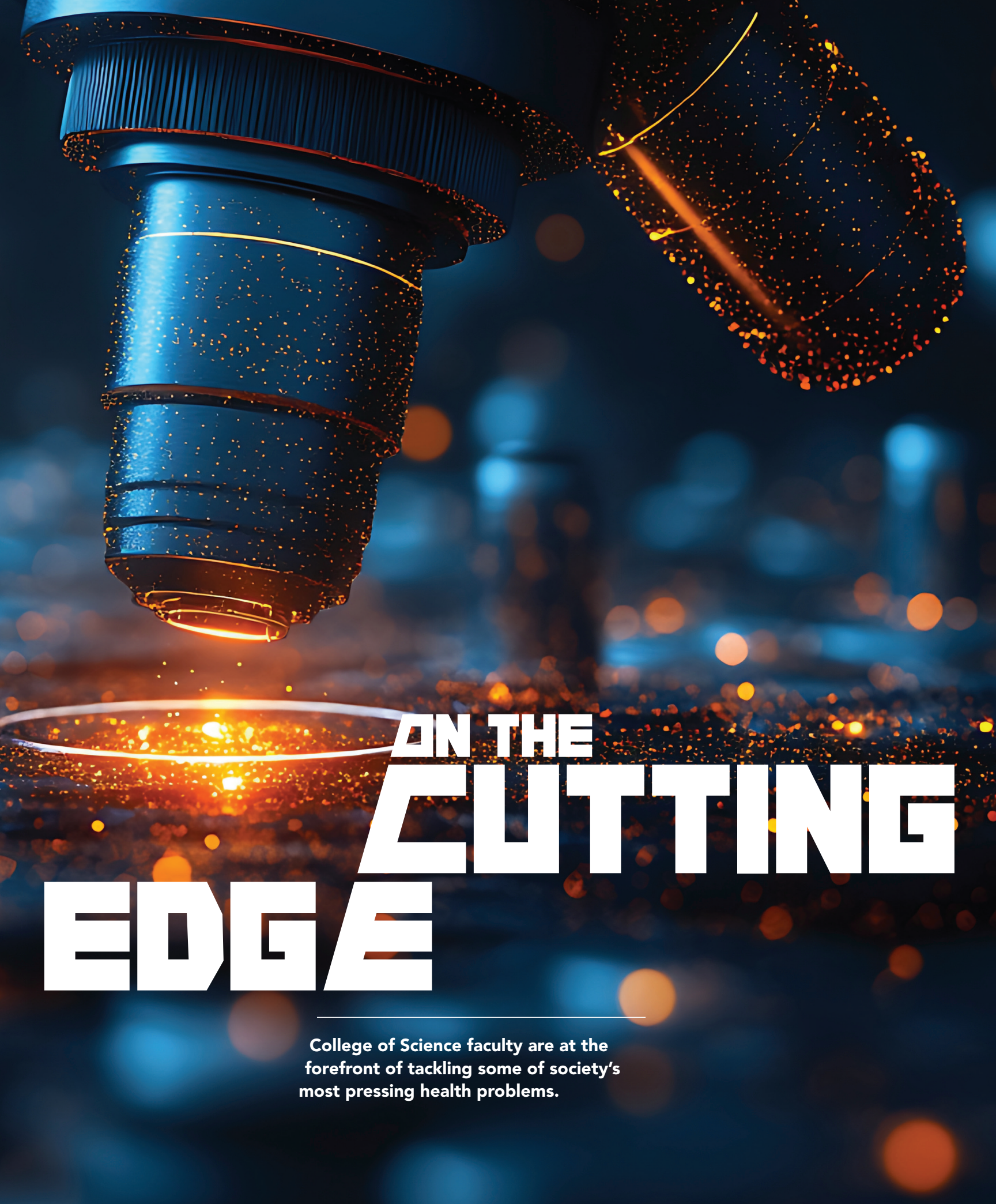


ON THE CUTTING EDGE

College of Science faculty are at the forefront of tackling some of society's most pressing health problems.

The number of serious health issues facing societies around the world seems never-ending, and the challenge in treating and curing them is daunting. Chronic conditions like diabetes and heart disease kill millions of people each year. Climate change and pollution further complicate the global health landscape by contributing to respiratory illnesses, waterborne diseases, and food insecurity.

In the face of these complex and evolving problems, scientific research stands as the most powerful tool we have to understand, prevent, and treat health issues effectively. Scientific research not only leads to medical breakthroughs, but also influences public health policies and interventions that can improve outcomes at the macro level.

In the College of Science, faculty from every department are involved in vigorous research into topics that affect human health. Through innovative and collaborative projects supported by funding from state, federal, and international agencies, our faculty and their students are making significant contributions to the collective effort to find cures and solutions to some of the most difficult global health challenges. These are just a few of many examples of the groundbreaking work happening in College of Science laboratories that is propelling UTA to the forefront of health science research.

COLLEGE OF SCIENCE BREAKTHROUGHS

Controlling Cholesterol By Blocking Enzymes

SUBHRANGSU MANDAL, professor of chemistry and biochemistry, studies human gene regulation, epigenetics, and disease. In a recent study, he and his lab team identified a new enzyme that can be switched off to help the body maintain healthy cholesterol levels. This is a significant development that could lead to new treatments for diseases that affect millions of Americans.

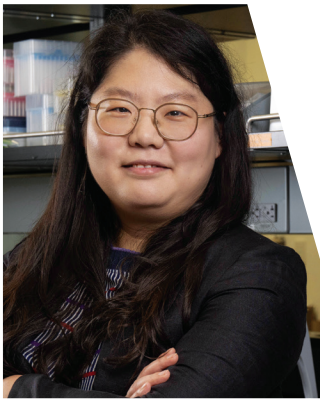
"We found that by blocking the enzyme IDO1, we are able to control the inflammation in immune cells called macrophages," Dr. Mandal says. "Inflammation is linked to so many conditions—everything from heart disease to cancer to diabetes to dementia. By better understanding IDO1 and how to block it, we have the potential to better control inflammation and restore proper cholesterol processing, stopping many of these diseases in their tracks."

Inflammation is crucial in helping the body fight infections and heal injuries. But when it becomes abnormal due to stress, injury, or infection, it can damage cells and increase the risk of serious diseases. During these periods, white blood cells called macrophages can't absorb cholesterol properly, which can lead to chronic disease.

Mandal and his team found that IDO1 becomes activated during inflammation, producing a substance called kynurenine that interferes with how macrophages process cholesterol. But when IDO1 is blocked, macrophages regain their ability to absorb cholesterol. This suggests that reducing IDO1 activity could offer a new way to help prevent heart disease by keeping cholesterol levels in check.

The researchers also found that nitric oxide synthase (NOS), another enzyme linked to inflammation, worsens the effects of IDO1. They believe that inhibiting NOS could provide another potential therapy for managing cholesterol problems driven by inflammation.

Studying Microplastics in Water Supplies



Microplastics making their way into drinking water are a real threat to health and the environment. **UN-JUNG KIM**, an assistant professor of earth and environmental sciences whose research focuses on environmental chemicals and persistent toxic substances, coauthored a recent study that found that while most wastewater treatment facilities greatly reduce microplastic particles, complete removal remains impossible with today's technology.

Manufacturers find plastic ideal for use in nearly every consumer good because it's inexpensive to produce yet lightweight and sturdy. But when a plastic item reaches the end of its useful life, it never truly disappears. Instead, it breaks down into smaller and smaller pieces, called microplastics, that end up in our soil and water.

"As a result, many microplastics are being reintroduced into the environment, likely transporting other residual harmful pollutants in wastewater," Dr. Kim says. "These microplastics and organic pollutants exist in trace levels, but we can get exposure through simple actions like drinking water, doing laundry, or watering plants, leading to potential long-term serious human health impacts such as cardiovascular disease and cancer."

Kim is also leading a yearlong study of how microplastics may impact the health of aging adults, particularly in relation to brain function and bone and muscle health. The project will explore how factors such as smoking, alcohol use, and socioeconomic status may compound the long-term health effects of microplastic exposure.

Clearing Dead Cells During Stress

PIYA GHOSE, an assistant professor of biology and developmental cell biologist, published a study with graduate students Aladin Elkhalil and Alec Whited that revealed a novel strategy for how the body cleans out dead cells during stress and showed unexpected roles for well-known stress-response genes. This could help scientists better understand diseases affecting the immune system, brain, and metabolism.

"The body is constantly creating new cells and removing old cells once they die," Elkhalil says. "This removal of dead cells is just as important as creating new ones because if the body is unable to rid itself of dead cells, it can lead to various health problems."

For the study, the team used *C. elegans*, a tiny, transparent roundworm that is widely utilized in genetic research because its transparent body allows scientists to observe cell behavior, including how cells die. Dr. Ghose and her students took advantage of these unique features in several innovative ways.

They examined stress-response genes—many of which have human counterparts—in a new context: how they help remove dying cells. Using gene-editing technology tools, they manipulated these genes to identify a specific stress-response pathway that activates to help in the removal of dying cells.

Understanding Memory and Aging

HUNTER BALL, an associate professor of psychology whose research focuses on memory, attention, and cognitive aging, is uncovering why memory lapses happen in older adults and how simple strategies can help prevent them. Memory lapses like missing appointments, forgetting tasks, or misplacing important items are among the most common challenges faced by older adults.

Dr. Ball studies prospective memory, or the ability to remember to carry out future intentions, along with working memory, episodic memory, and metamemory. His work shows how age-related changes in these systems shape everyday forgetfulness and how "cognitive offloading"—using reminders, notes, or other external aids—can reduce the mental burden that leads to missed tasks.

"As adults age, changes in memory can make daily life more difficult," Ball says. "But small supports, like setting a phone reminder, can dramatically improve follow-through and help maintain independence."

A recent National Institutes of Health-funded project from Ball's lab demonstrated how external reminders can eliminate age-related declines in prospective memory under demanding conditions, pointing to low-cost, highly practical solutions for real-world cognitive challenges.

Using Predictive Modeling to Treat Disease

SUVRA PAL, an associate professor of mathematics who studies statistics, is working to develop advanced predictive models designed to improve disease treatment by predicting whether or not a patient can be cured. These models could potentially transform how doctors treat cancer and other serious illnesses.

The project aims to improve the accuracy of predicting whether a patient is likely to be clinically cured—particularly when the disease is detected early—by using cutting-edge statistical methods and artificial intelligence, including machine learning.

Using these techniques, researchers analyze large sets of patient data to identify patterns and trends that aren't obvious to the human eye. By training algorithms to recognize which factors are linked to long-term survival or a cure, the models can offer more personalized and accurate predictions for patients.

"Traditionally, models have focused on survival outcomes, but they haven't been able to predict an actual cure," Dr. Pal says. "Our models aim to do both: estimate the probability that a patient will be cured and, if not, predict their long-term survival."