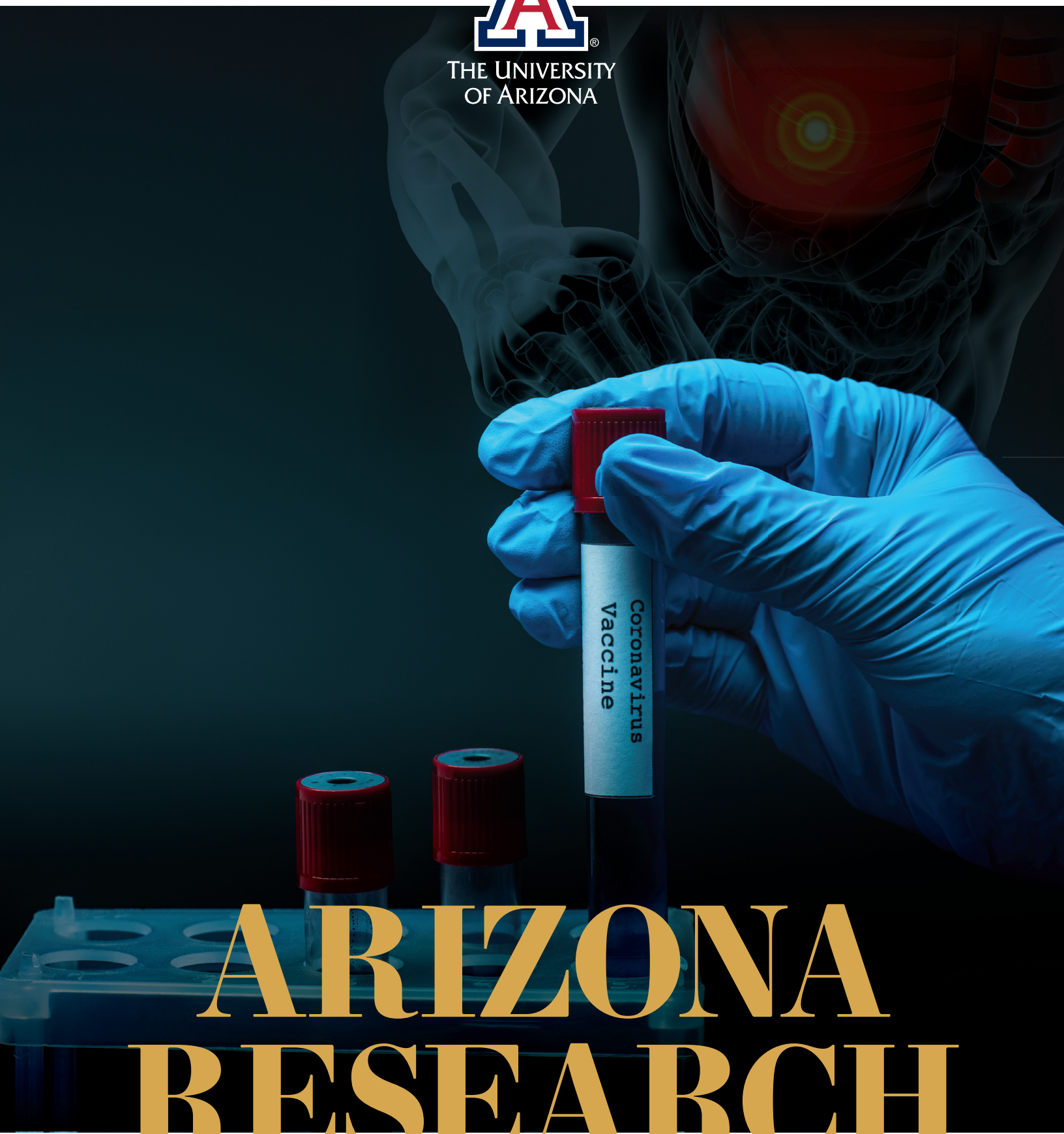
THE UNIVERSITY OF ARIZONA



ARIZONA RESEARCH

THE UNIVERSITY OF ARIZONA RESEARCH MAGAZINE | HEALTH

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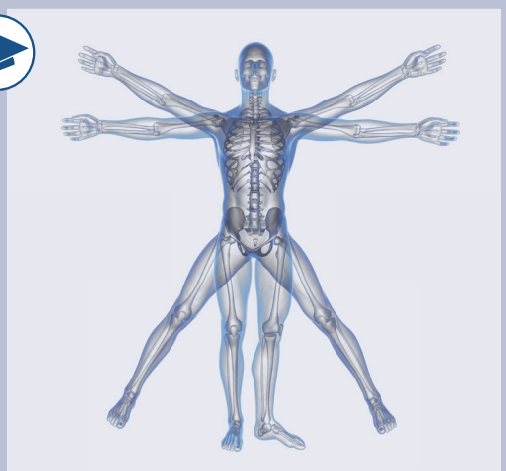

EDUCATION

University of Arizona Land Acknowledgment

We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the university strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.

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HEALTH

INTRODUCTION

In the time it takes you to read this sentence, more than 3 million people around the world will have died of cancer. Another 3+ million will have been diagnosed with dementia, and 780 million will continue living with chronic pain.

In recent years, progress in genetics, machine learning, material science, and a host of otherwise disparate fields have converged to put modern medicine on the cusp of revolutionary change.

University of Arizona researchers are helping to lead that revolution, bringing Arizonans life-changing interventions that ultimately improve health outcomes worldwide.

With a coalition of physicians, public health experts, scientists, and engineers, we are unsnarling the etiologies of complex diseases, breaking down unjust health disparities, girding for pandemics we can't foresee, and developing ways to help all people live longer, healthier lives.


Coronavirus
Vaccine

New Research Could Make Alzheimer's Preventable by 2025

Doctors diagnose 10 million new cases of dementia yearly, and that number is projected to triple by 2050. Dementia is often caused by Alzheimer's disease, for which there is no known cure. New lines of University of Arizona research could change that.

Researchers at the UArizona Center for Innovation in Brain Science (CIBS) begin with existing data and use artificial intelligence and bioinformatics to mine for risk factors and medications that could be helpful for preventing or treating Alzheimer's.

Rui Chang, a CIBS computational biology investigator, used AI to analyze data from the brain tissues of deceased Alzheimer's patients. He then created a model demonstrating how changes in even a single gene influenced disease progression.

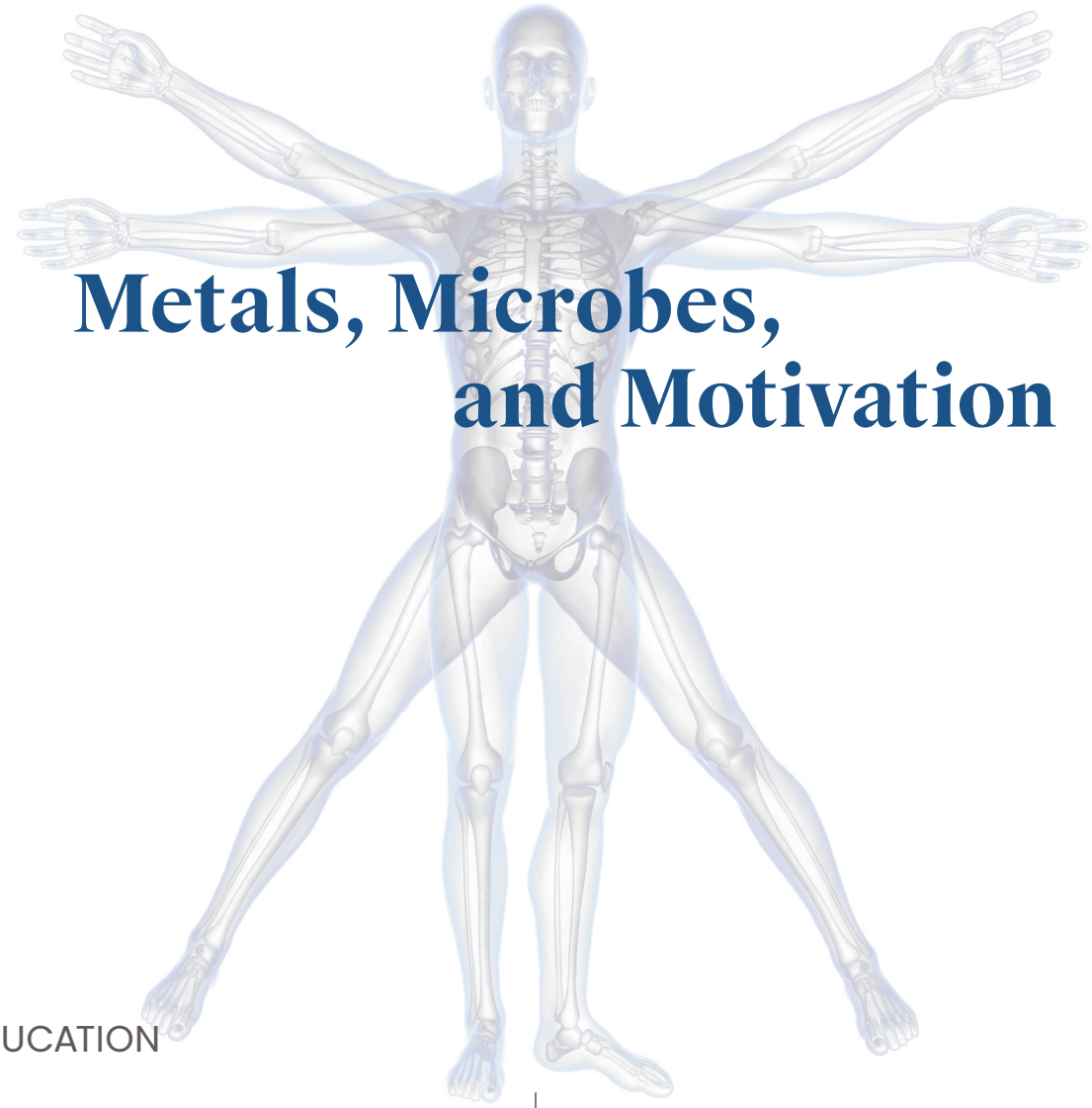
Targeting genes dysregulated early on in Alzheimer's, Chang identified three compounds that, in mice with Alzheimer's, improved memory so dramatically that their brain function nearly "caught up" to that of mice with no disease—an achievement never before demonstrated.

In parallel research, Francesca Vitali, associate director of bioinformatics at CIBS, used AI to study vast quantities of data on Alzheimer's patients before they were diagnosed—medical histories sometimes spanning decades.

Vitali identified more than 300 diseases and conditions linked to higher risk for Alzheimer's, then mined drug information repositories to identify more than 600 approved medicines used to treat those conditions.

Vitali's published analyses were so promising, they inspired a very hopeful and specific prediction: "We believe that early interventions that strategically target known risks for developing Alzheimer's could effectively make this a preventable disease by 2025."

Learn More



Metals, Microbes, and Motivation

EDUCATION

The interaction of metals and microbes is just one focus of associate professor of immunobiology Michael Johnson. Another is inspiring undergraduates to pursue careers in biomedical research and graduate students to conduct their research with optimism and creativity.

During his postdoctoral fellowship, Johnson founded Science Sound Bites, a podcast for kids. At the University of Arizona, he founded the BIO5 Postdoctoral Fellowship Program to fund postdoctoral researchers.

Most recently, Johnson co-founded the National Summer Undergraduate Research Project (NSURP) to serve undergraduate students of color affected by COVID-19.

In its first year, NSURP arranged microbiology lab mentorships for 250 undergraduates, most of them first-generation college students, from nearly 150 universities. Participants spent a summer conducting research, communicating their work, and learning from STEM professionals with backgrounds that often paralleled their own.

Johnson hopes NSURP will inspire future matchmaking programs emphasizing diversity, equity, and inclusion in STEM. “We really need support,” he says. “Bandwidth is low, but demand is high.”

Learn More

Wearable Health Monitors with a Perfect Fit

University of Arizona engineers have developed what they've named "biosymbiotic devices"—wearable monitors 3D-printed based on body scans to create a perfect fit.

Imagine a custom-fitted health monitoring device that hugs your bicep, calf, or torso without adhesive. It is lightweight and breathable, strategically placed sensors continuously measure data points like core body temperature or muscle changes, and it never needs a charge.

University of Arizona engineers have developed what they've named "biosymbiotic devices"—wearable monitors 3D-printed based on body scans to create a perfect fit.

A welcome bonus: these devices use wireless power transfer with a range of several meters. When the wearer moves out of range, a small energy storage unit provides power.

Biosymbiotic devices could radically improve disease tracking and treatment, drug testing, and personal health monitoring. Far more sophisticated than heart rate monitors or step counters, they will potentially detect increasing frailty in older adults, diagnose diseases, and test the efficacy of new drugs.

Learn More

Chronic pain affects one in three Americans and significantly diminishes quality of life for approximately one in 10, driving many to opioids, addiction, and accidental death by overdose.

University of Arizona researchers are working to put an end to this tragic trajectory.

Scientists at the UArizona Comprehensive Pain and Addiction Center (CPAC) are combating the opioid crisis by discovering pain-relief alternatives to opioids, working to prevent relapse from opioid use disorder, and developing effective medications for opioid overdose.

The team benefits from data on 18,000 unique research molecules developed by Purdue Pharma to address chronic pain and addiction. It also uses more than 40,000 human bio samples from patients in two decades of clinical trials involving opioids and non-opioids.

CPAC also aims to train students and the existing workforce to treat substance use disorder more effectively. Outreach includes establishing a Southwest-region addiction science network to further study and educate about the overlap between pain and addiction.

Learn More

Fighting Chronic Pain and Addiction

$60 Million Investment to Help Brains Keep Up with Bodies

Why do so many people experience cognitive declines in their later years? The bottom line is that humans' cognitive life span doesn't match the body's lifespan overall.

With the support of a $60 million grant from the National Institutes of Health, UArizona researchers are tackling that gap through the Precision Aging Network.

The network connects neuroscientists and other experts to apply precision medicine to the aging brain.

The researchers are discovering how health professionals can better serve seniors with interventions rooted in genetics, lifestyle, environment, and other factors rather than relying on a one-size-fits-all approach.

While addressing Alzheimer's disease and dementia are priorities, researchers hope their work can help anyone since even what is considered "normal" age-related cognitive declines can reduce quality of life for aging patients as well as their families and caregivers.

Addressing Health Care Disparities
The Precision Aging Network is working to ensure its studies comprise adults of different ages, ethnicities, and backgrounds. An important goal of the initiative is to expand knowledge about populations historically underrepresented in aging research.

Learn More

The Shifting Challenges of Covid-19

More than two years into the pandemic, the University of Arizona remains at the forefront of institutions shining light on how to address future diseases, even as we grapple with lingering mysteries of COVID-19.

Studying Vaccine Efficacy and Attitudes

With a $15 million grant renewal from the Centers for Disease Control and Prevention, the UArizona-led AZ HEROES study is analyzing COVID-19 immunity and vaccine effectiveness in front-line workers, children, and populations historically underserved in health care and research.

Results from the study show that individuals who contract COVID-19 after vaccination have less virus in their systems, shorter infection times, and milder symptoms compared to unvaccinated people who get the disease.

Researchers are also studying knowledge, attitudes, and practices around COVID-19 vaccines: Why are some people enthusiastic about vaccines and boosters? Why do others refuse them? Why do some people follow vaccine recommendations, but only partly?

Ultimately, scientists hope to better understand connections between behaviors and what individuals know and think about the virus and vaccines.

Unpacking the Enigma of Long COVID

Backed by $9.2 million in first-year funding, the university is participating in the National Institutes of Health RECOVER study. The initiative aims to discover why one in three people who get COVID-19 remains symptomatic for weeks or even months.

One of 30 RECOVER teams nationwide, UArizona researchers are leading a statewide collaborative effort to better understand these recovery discrepancies and how to prevent or minimize long-term damage to health and quality of life.

Learn More

Minimizing Losses, Maximizing Lessons Learned

From the pandemic's earliest days, the University of Arizona has made significant contributions to fighting and understanding COVID-19. Now, its Aegis Consortium is converging great minds across disciplines and around the world to study pandemic preparedness, prediction, and control.

Wearable sensors are helping some researchers track the secondary and long-term effects of COVID-19, while others look backward to examine why some hospitals better dealt with uncertainty and the influx of patients. Some Aegis projects aim to understand the impact of K–12 school closures on children, other projects involve collaborating with senior living associations to learn about the impact of the pandemic on older adults.

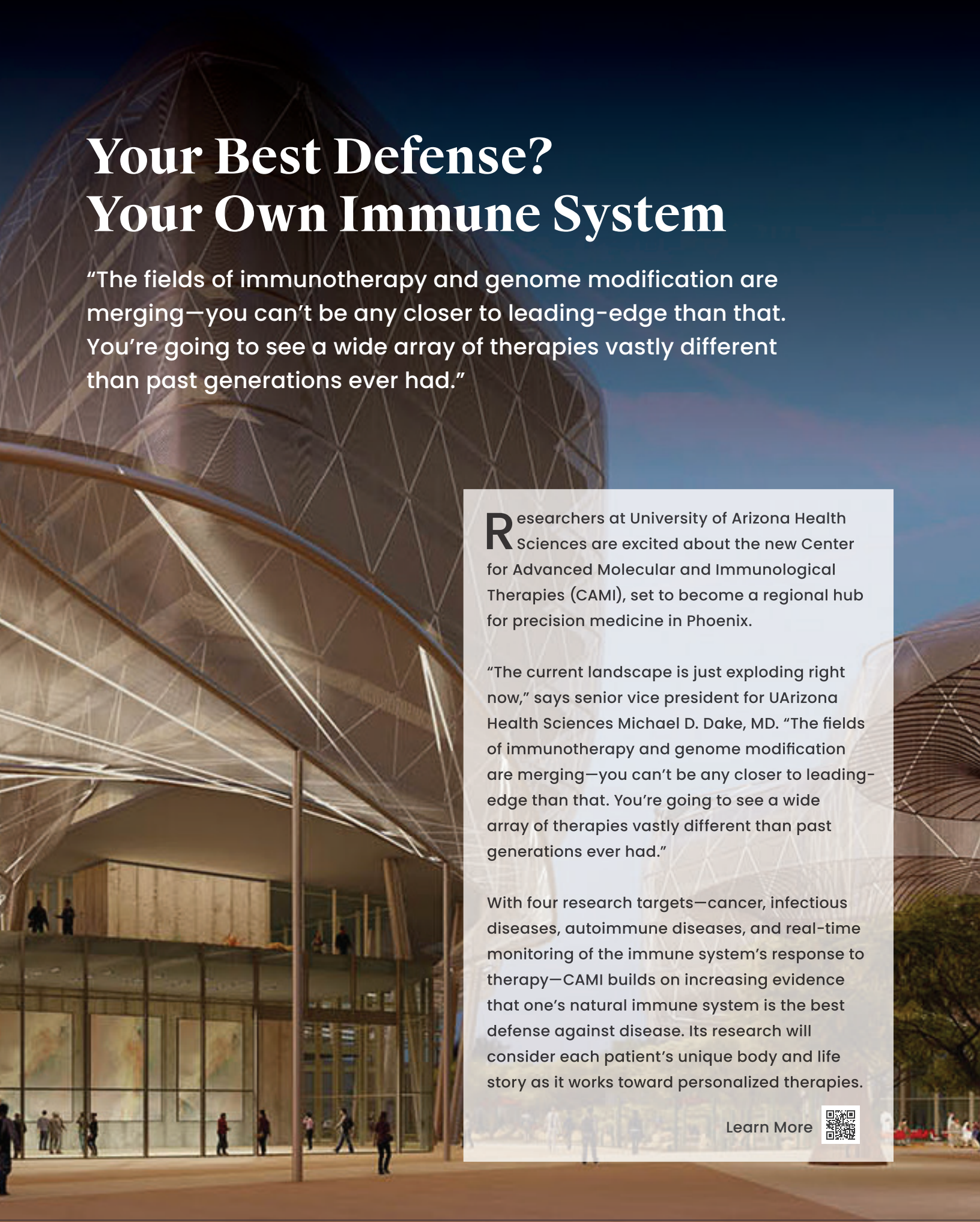
The consortium is also studying how built environments—the buildings in which we live, work, and play—can be part of the problem or solution in a pandemic.

Scientists are creating a building index system to rate risks of infection, developing new technologies to reduce disease spread in built environments, and exploring ways to detect airborne viruses in real time.

Learn More

Your Best Defense? Your Own Immune System

"The fields of immunotherapy and genome modification are merging—you can't be any closer to leading-edge than that. You're going to see a wide array of therapies vastly different than past generations ever had."



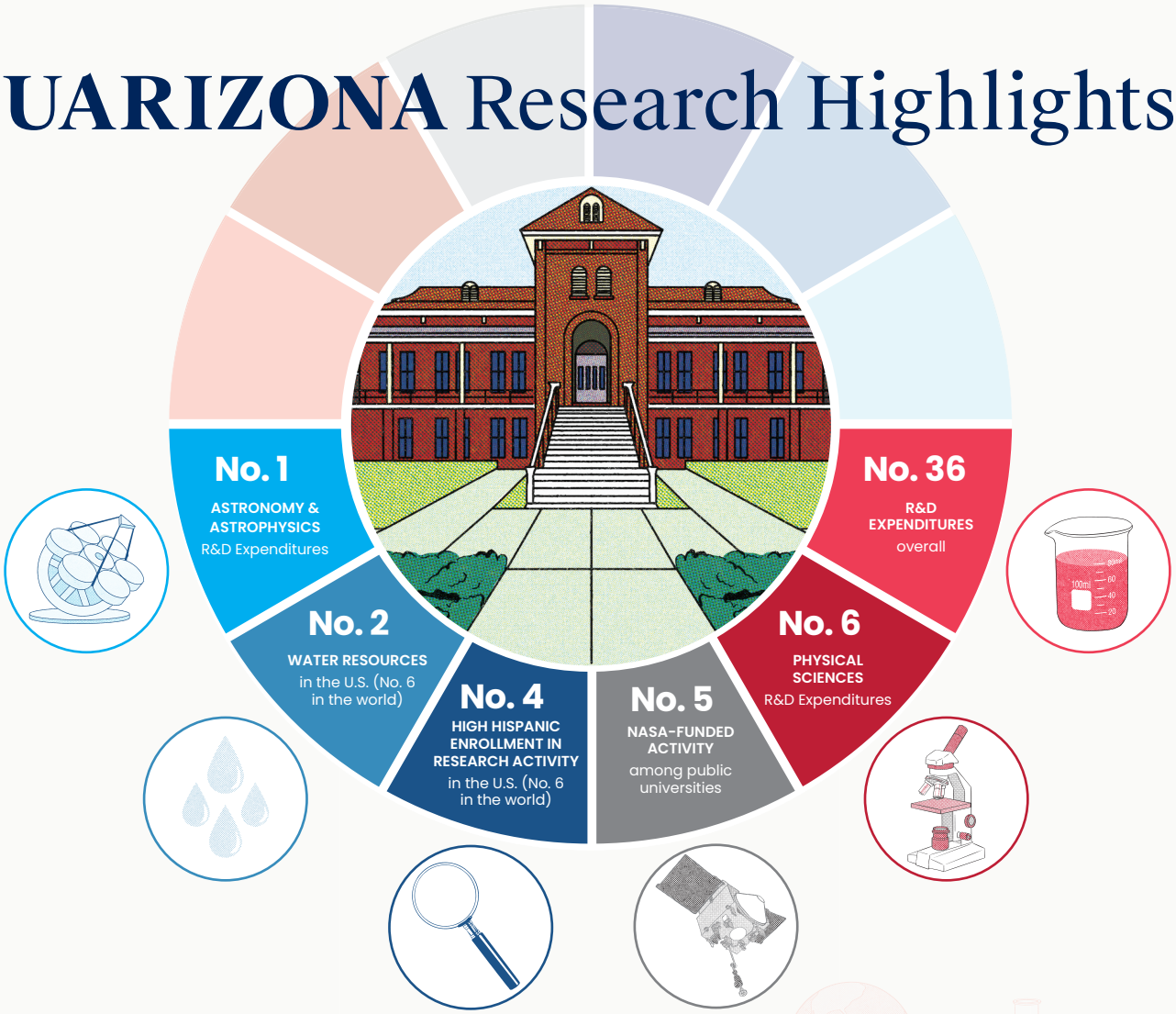
Researchers at University of Arizona Health Sciences are excited about the new Center for Advanced Molecular and Immunological Therapies (CAMI), set to become a regional hub for precision medicine in Phoenix.

"The current landscape is just exploding right now," says senior vice president for UArizona Health Sciences Michael D. Dake, MD. "The fields of immunotherapy and genome modification are merging—you can't be any closer to leading-edge than that. You're going to see a wide array of therapies vastly different than past generations ever had."

With four research targets—cancer, infectious diseases, autoimmune diseases, and real-time monitoring of the immune system's response to therapy—CAMI builds on increasing evidence that one's natural immune system is the best defense against disease. Its research will consider each patient's unique body and life story as it works toward personalized therapies.

Learn More

UARIZONA Research Highlights



ENTREPRENEURSHIP
(FY21)

274 invention disclosures
+11 over previous year

124 licenses & options
for university inventions
+29 over previous year

100 patents issued
Ranked no. 28 among worldwide universities granted U.S. utility patents

17 startups launched
125+ since 2012

$1.6B in economic output
from commercialization activities between FY17-FY21

Through cutting-edge research and innovation, the University of Arizona is committed to expanding human potential, exploring new horizons, and enriching life for all. With $824M in annual research activity, we are leading the way in tackling the most pressing and complex challenges of our time, from climate change to planetary defense, and pandemic preparedness to healthy aging.

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