OFFICE OF RESEARCH

IMPACT

REPORT 2017

Harnessing BRAIN POWER

University of CINCINNATI

For a print copy of this report, please contact Heather Geers: ***heather.geers@uc.edu***

WELCOME

The University of Cincinnati is, by design, a powerhouse of a neighbor. Our home, the Greater Cincinnati region, provides us with rich resources, from a consistently top-ranked international airport to multiple Fortune 500 corporate headquarters that help support innovation and an enviable quality of life.

Our urban home also provides us with important opportunities to impact–and improve–the lives of our neighbors, near and far. Our researchers collaborate on groundbreaking disease treatment, space-age technological discoveries and community-partnered work to support equitable healthcare and other critical issues. Plus, we are training new generations of thinkers and doers to take the lessons of their classes and turn them into world-changing action.

Our researchers' success also has a financial impact on our home. We know that our hundreds of millions of dollars in sponsored research funding spark economic growth and investments in our region, and we are increasing our internal investments to build toward a robust future.

We're proudly investing in our research faculty, who work across disciplines and colleges to develop holistic solutions to global challenges, many of which are manifested in our own backyard. Our researchers are national and global stars, whether they are pushing the boundaries of stroke recovery through innovative clinical research or partnering with communities to bridge economic and justice divides.

Through strategic investments, such as our areas of excellence, and innovative programs, like our Skin Science collaborative, our Office of Research helps shape the vast research portfolio of our highly ranked urban research institution. In this report, you'll meet some of the stand-out people inspiring those investments and glimpse a few of the far-reaching connections fueled by their passions.

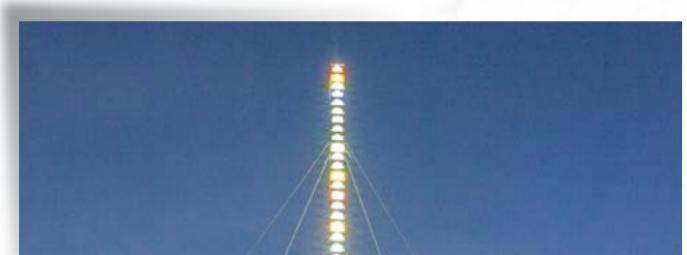
Patrick Limbach, PhD
Vice President of Research
Ohio Eminent Scholar
Professor of Chemistry

"I have worked collaboratively with the Cincinnati Fire Department and City of Cincinnati to research hazards to firefighters and develop outreach and risk messaging was useful for passing Ohio's Senate Bill 27 (131st General Assembly) that provides compensation for firefighters with Cancer."

*—**Erin Hayes**, DrPH, MS, Associate Professor, Department of Environmental Health, College of Medicine (pictured, right, with Julie Reese, City of Cincinnati Safety Department)*

"My work focuses on community-engaged research for health equality. By partnering with local individuals and community organizations, **I am able to conduct collaborative research that has the potential to move the needle on health disparities in Cincinnati.** Working with people who are passionate about our community and translating scientific evidence to real world outcomes gets me out of bed in the morning; community impact of research is one of my fundamental values."

*—**Farrah Jacquez**, PhD, Associate Professor, Psychology, College of Arts and Sciences (pictured, right, with her co-Robert Wood Johnson Interdisciplinary Research Leader Fellows Jaime-Lee Morris, New Prospect Baptist Church, and Michael Topmiller, American Academy of Family Physicians)*



LIGHTS, ART, ECONOMIC ACTION

When a coalition of Cincinnati developers, philanthropists, creatives and nonprofits created the first-ever BLINK Cincinnati–a four-day light, art, and projection mapping event that drew global attention and a million attendees in 2017–they partnered with faculty and students from three different University of Cincinnati colleges.

The result was a public art installation that was part of a brightened 20-block spectacle reaching from the city's riverfront to downtown's northern edge. BLINK exceeded all expectations for community and financial impact.

Joe Girandola and Matt Lynch, associate professors at the School of Art in the College of Design, Architecture, Art, and Planning, collaborated with adjunct art professors as well as students from the College of Engineering and Applied Sciences and a lighting expert from the College Conservatory of Music to create a towering sculpture they called "Endless Commerce". Constructed of more than 60 multi-colored milk crates, each illuminated from within, the tower stopped passersby in their tracks.

"BLINK has been instrumental in my continuing research," says Girandola, who also serves as director of graduate studies for the School of Art. He adds that working with developers to create art on a vacant lot allowed the community discussions while being a part of an economic powerhouse of an event for the region.

REWRITING HISTORY

Samples of data visualizations created by W.E.B. Du Bois and his graduate students that earned them a gold medal at the Paris Exposition of 1900. Images from the Library of Congress.

Correcting false historical narratives has become an important part of the 21st century academia. But decades before such revelatory research was trendy, Earl Wright II, PhD, was making discipline-shifting discoveries about American sociologist W.E.B. Du Bois and his work at Atlanta University.

His research showed that Du Bois and his students' work in the 1800s in Atlanta not only pre-dated other American sociological pioneers, but also formed the basis for including "methods" sections in research papers and using insider interviewers to gather high-quality data in the field. Wright not only reshaped the understanding of his discipline, but he also highlighted the role of African Americans in building the field in the first place.

"My calling is to figure out where early African Americans fit in and to actively provoke their inclusion in the sociological canon," says Wright, now a full professor of Sociology in the College of Arts and Sciences. His book, "W.E.B. Du Bois and Atlanta Sociological Laboratory: The First American School of Sociology," was published in 2016, the same year Wright won national acclaim when he received the 2016 Charles S. Johnson Award from the Southern Sociological Society.

Earl Wright II

SMART THERAPY FOR TEENS

As she explored novel approaches to combat teen dating violence, Carolyn Smith, PhD, found herself gaining traction–and National Institutes of Health support–by working in an unexpected setting: domestic violence shelters.

The College of Nursing researcher's passion, preventing violence against women, led her to consider its roots, in particular among children who witness intimate partner violence. Those children, she knew, are more likely to engage in risky behavior and fall into violent relationships themselves.

She designed a two-year study in partnership with one of her research idols, Donna Martsolf, PhD, also at the University of Cincinnati, to reach these vulnerable teens in vulnerable teens in vulnerable spaces: the shelters where their mothers seek refuge from abusers.

Along with a website that features content focused on developing healthy behaviors, Smith's study features individualized FaceTime sessions that pair male and female Nursing students with male and female teens for a near-peer counseling. Both cost-effective and scalable, the innovative set of interventions has the potential for broad impact through cross-agency and shelter resource-sharing, she says.

Smith's research is being funded by **$248,842 from an R21 grant from the Eunice Kennedy Shriver National Institute of Child Health and Development.**

LEADING BY LISTENING

Associate Professor Farrah Jacquez, PhD, Psychology, conducts research in partnership with community members to address health disparities in immigrant and minority communities near campus.

A community non-profit that needs help collecting and analyzing data. A government-led coalition in search of neighborhood priorities. A group of immigrants eager to end health disparities among their peers in Cincinnati.

These three projects, among dozens of others, took shape as a part of The Cincinnati Project, a collaborative effort at the University of Cincinnati launched in January 2016 to connect faculty, staff, and students in the College of Arts and Sciences directly with community members and partners.

With representatives from 10 departments, The Cincinnati Project harnesses faculty members' strengths with the goal of creating a more inclusive and equitable city. So far, more than 340 faculty, staff and students have engaged with community members, non-profits, governments and agencies focused on:

- economic justice
- health equity
- racial equality
- improved conditions for women

Being responsive to community needs allows University of Cincinnati researchers to apply their academic expertise in powerful ways, says Jennifer Malat, PhD, professor of Sociology, co-founded and director of The Cincinnati Project. She sees the work as an important part of the urban research institution's academic and social responsibility.

Much of the community-engaged work infused both graduate and undergraduate courses with the kind of real-world energy that shapes career paths. But The Cincinnati Project's potential for innovation and impact also attracts talented faculty researchers and forward-thinking funders.

For example, the **Robert Wood Johnson Foundation awarded more than $200,000 from its national Interdisciplinary Research Leaders Program** to a team featuring Cincinnati Project member and Associate Professor of Psychology Farrah Jacquez.

As part of the team, Jacquez works with community and healthcare partners to combat health disparities.

TONGUE TWISTERS:

Cross-campus Researchers Break Down Speech Barriers

Correcting speech sound disorders is complicated business. It requires shifting well-established motor learning and motor speech components in the brain and the tongue, tasks that pose daunting cognitive challenges. It requires developing and applying diagnostic tools and procedures that cross disciplinary boundaries, linking biomedical engineering, psychology and communication sciences and disorders.

In other words, it requires a silo-busting research team eager to work across colleges and disciplines to solve a complex problem–like the team recently funded to do just that, thanks to a **$100,000 Strategic Collaborative Research Grant from the University of Cincinnati Office of Research.**

Lead researchers for the project have appointments in the Department of Communication Sciences and Disorders in the College of Allied Health Sciences, the Department of Biomedical, Chemical and Environmental Engineering in the College of Engineering and Applied Science and the Department of Psychology in the College of Arts and Sciences.

Up to 10 percent of people in the U.S. are affected by some type of communication disorder, and costs for therapy and treatment already amount to nearly $200 billion every year.

The grant-winning speech sound disorder researchers aim to develop a speech therapy game changer, with results that would benefit:

- English language learners
- Children who are hard of hearing
- People who stutter
- People with swallowing disorders

In addition, the researchers noted that their work has broader implications for advances in disabilities engineering (an area funded by the National Science Foundation) and for producing or eliminating accents or learning particularly difficult-to-pronounce sounds in foreign languages (an area with funding potential from the Department of Defense).

WATER EXPERTS UNITE

Researchers from five University of Cincinnati colleges joined more than a dozen experts from across the nation to explore sustainable solutions to local, regional, national and global water challenges at the university's 2017 Water Summit.

During the two-day gathering in August 2017–which was organized by the Taft Research Center and the Office of Research–experts and practitioners discussed the planet's most precious resource, with topics ranging from water technology and innovation to water justice and human settlements.

Representatives attended from universities, nonprofits and governmental organizations, including the World Bank Group, the City of Cincinnati and CONFLUENCE, the regional water technology innovation cluster.

The Water Summit also featured discussions that engaged campus researchers from the College of Design, Architecture, Art and Planning; the College of Engineering, Applied Science; the College of Medicine; and the College of Arts and Sciences, including faculty whose research focuses on:

- engineered water systems
- storm water management
- wastewater treatment
- carbon and nutrient cycles
- water quality
- water resources
- watershed hydrology
- the interdependency of natural and urban water resources
- large-scale sensing and data management
- the interaction between human settlements, landscape and water

BEYOND BRAIN SURGERY

Looking for the next big idea in a trans-disciplinary lab where clinical trials are changing lives in real time

Oluwole Awosika, MD, Pierce Boyne, PT, DPT, and Aimee Dietz, PhD, CCC-SLP, co-direct the Neurorecovery Laboratory

In the 1980s, University of Cincinnati medical research doctors pioneered the use of the clot-busting drug tPA, or tissue plasminogen activator, now globally recognized as the gold standard in stroke care.

Decades later, their legacy reverberates in millions of lives changed for the better–and in a thriving lab where cross-trained researchers reimagine life after stroke for survivors at all ages and stages of recovery.

The university's storied history of innovations in stroke care attracted Oluwole Awosika, MD, to join the UC Gardner Neuroscience Institute in 2016. Awosika's pedigree includes a double bachelor's from UCLA, a neurology residency at Massachusetts General/Brigham and Women's Hospitals/ Harvard Medical School and a post-doctoral research fellowship at the National Institutes of Health.

"I knew this was the right place to be," says Awosika, a College of Medicine assistant professor. He works alongside other neurologists–as well as physical and occupational therapists, speech language pathologists and psychiatrists—as part of an ambitious trans-disciplinary research team that develops and oversees clinical trials for patients more than six months after their strokes. The timing is important because Awosika and his colleagues target patients beyond the reach of traditional post-stroke therapy, patients who have been told they have no more progress to make. Awosika and the rest of the stroke rehab team, though, believe otherwise.

The successes of Cincinnati's stroke treatment program, along with other medical advances that allow people to live longer after strokes and other shocks to their systems, have contributed to demand for more rehabilitation options. Longer lives can also lead to new sets of stressors for people with limited mobility and brain function, as well as those who care for them.

PROVIDING TREATMENT–AND HOPE

In one recent clinical trial, Awosika watched a man who, 12 years after his stroke, dramatically improved his ability to walk independently after just six weeks of therapy. The patient increased his six-minute walk distance by 120 meters–or more than the length of an NFL football field. "Normally, 20 meters (63 feet) is good," Awosika says.

"Normally, 20 meters is great," adds Brett Kissela, MD, the chair of the Department of Neurology and Rehabilitation Medicine. Kissela was the 18th hire for the College of Medicine's neurology department in 2000, when tPA innovator Joseph Broderick, MD, led the group.

Today, Broderick directs the UC Gardner Neuroscience Institute, which includes more than 125 physicians and researchers. A new, $60.5 million home for the institute is set to open in 2019, thanks in part to a $14 million gift from a grateful patient.

"When you have a stroke and you are left impaired, it feels hopeless," says Kissela, who carries a laminated list of the Neurorecovery Lab's current clinical trials, his "cheat sheet," to connect his rehab patients with opportunities to extend their recoveries. "The way our current healthcare system works, you are abandoned after the first six months, more or less. Knowing that there is a group of really smart people who are really trying to find solutions, it just brings hope."

A recent list of ongoing clinical trials at the stroke rehab lab included:

- directly stimulating targeted areas of the brain through the skin using MRIs to map responsive areas
- closely monitored high intensity interval training as post-stroke physical therapy
- yoga for patients and caregivers
- iPads programmed to speak common messages to ease pressures on stroke patients with speech language disorders.

ACCELERATING ADVANCES THROUGH TEAMWORK

Researchers from the College of Medicine routinely partner with peers from the College of Allied Health Sciences (departments of social work, speech language pathology, physical and occupational therapy), the College of Nursing and the College of Arts and Sciences.

Kissela notes that those collaborations, known as trans-disciplinary because each researcher brings distinctive disciplinary strengths and perspectives to projects, provide both short and long-term benefits.

"Things we learn in one field aren't just for that field but will have applicability somewhere else," says Kissela, who sees collaboration as "part of what accelerates the science."

Awosika, for example, specializes in mobility and has a history of researching traumatic brain and spinal cord injuries. What he learns through stroke rehab trials helps him continue to unravel the mysteries of how the brain controls walking, which can help patients with a wide range of neurological disorders.

"There are a lot of commonalities that lead to some new and creative thoughts and that could be the next big idea," Kissela says.

> "Knowing that there is a group of really **smart people who are really trying to find solutions, it just brings hope.**

CHALLENGING THE STATUS QUO, GETTING RESULTS

Early career researcher Pierce Boyne, PT, DPT, is a Cincinnati native and physical therapist who has spent his entire academic life at UC. He assisted with clinical research while he was an undergraduate at UC under the mentorship of Kari Dunning, PT, PhD, a long-time member of the stroke rehab team.

Boyne spearheaded a series of pilot studies in the lab testing the use of high intensity interval training–the kind of conditioning associated with elite athletes–with stroke patients, some of them decades after their strokes.

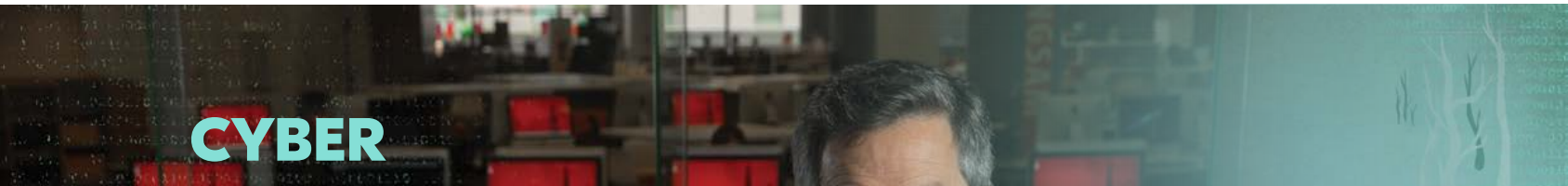
"It used to be thought that if you challenged someone who had had a stroke, they were going to compensate more, and their walking quality would get worse," Boyne says. "In fact, it usually gets better if you just ask people to try walking faster. One reason is that we use momentum more efficiently when walking closer to normal speed."

He credits his surprising pilot findings–along with pointers from research veterans Dunning, Kissela and Broderick–for his early grant success. Against formidable odds, his first-ever R01 grant application to the NIH to expand the study in Cincinnati and other sites across the country scored in the fundable range and is planned to start in 2018.

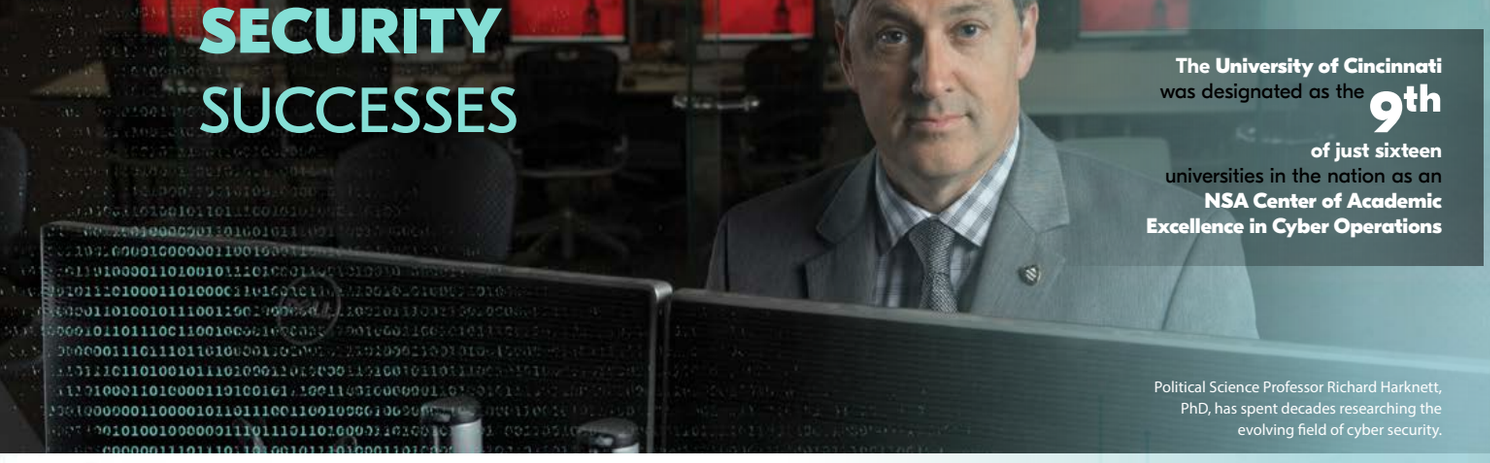
When it comes to describing the reactions of patients and their family members, Boyne echoes his colleagues who have seen dramatic, and sustainable, increases in mobility and brain function. "People certainly get tired, but there is also an uplifting effect," he says. "You would hope it makes people more motivated to continue."

Motivation is another common thread in the rehab lab, not just for the patients, but also for the researchers they inspire.

"Here in Cincinnati, we are part of the solution," Kissela says. "We are not just going to be care providers, we're going to change the game for tomorrow."



SECURITY SUCCESSES



The University of Cincinnati was designated as the **9th** **of just sixteen** universities in the nation as an **NSA Center of Academic Excellence in Cyber Operations**

Political Science Professor Richard Harknett, PhD, has spent decades researching the evolving field of cyber security.

For more than 25 years, College of Arts and Sciences Professor of Political Science Richard Harknett, PhD, has researched and advised senior government officials on how to protect against and manage national security threats, both real-world and cyber, in an interconnected world.

Harknett's impressive resume includes cybersecurity briefings at the White House, Pentagon, U.S. State Department and Great Britain's No. 10 Downing St. His public service dates back to the 1990s, when he advised the Clinton administration on the development of critical cyber infrastructure protection. In the 2010s, he was appointed by Governor Kasich to Ohio's Cyber Security Education and Economic Development Council.

> **"We need an all-hands-on-deck approach ... to ensure a well-rounded workforce that can protect the nation."**
> *—Richard Harknett*

In 2016, Harknett became the first scholar-in-residence for U.S. Cyber Command and the National Security Agency (NSA), both part of the U.S. Department of Defense, where he interacted with top American military and intelligence leaders to improve the nation's cybersecurity policies.

He was awarded an **IPA grant of $150,000 from the NSA** to pursue this work over eight months working within the Command and Agency. During this period, he was selected as the inaugural U.S.-U.K. Fulbright professor to serve as a scholar in cybersecurity at the University of Oxford, United Kingdom.

An academic at heart, Harknett shrugs off the accolades. "I take very seriously the fact that we're a public research university and that there's a public service role for us" to play at UC, he says.

Harknett has been active as well on the curriculum/program-building side of cybersecurity. He spearheaded a regional effort that led to a National Institute of Standards and Technology grant of $200,000 to establish a regional Cincinnati-Dayton Cyber Corridor consortium to improve workforce development in cybersecurity. In 2017, he received another **NSA grant of $90,000** to create a web-based platform to support a national cybersecurity curriculum development initiative.

At UC Harknett has facilitated multidisciplinary coordination between various computing departments and those that study security from a social science approach. Harknett helped steer the development of a new multidisciplinary cybersecurity certificate track at UC in 2014. It is geared toward students interested in technology, public policy and strategy.

The offering quickly took off. The University of Cincinnati was designated as the ninth of just 16 universities in the nation as an NSA Center of Academic Excellence in Cyber Operations. UC subsequently earned the NSA designation in Cyber Defense as well. The NSA initiatives aim to reduce vulnerability in national information infrastructure by promoting higher education and research in cyber defense and producing professionals with cyber defense expertise.

A collaboration between the College of Arts and Sciences and the College of Education, Criminal Justice, Human Services and Information Technology, the cybersecurity program attracts students interested in policy as well as those who want to work at a coding level. Harknett says the multidisciplinary approach to the program is essential.

It also attracts funding. **The Ohio Department of Higher Education recently awarded UC $1.9 million for their Ohio Cyber Range Project.**

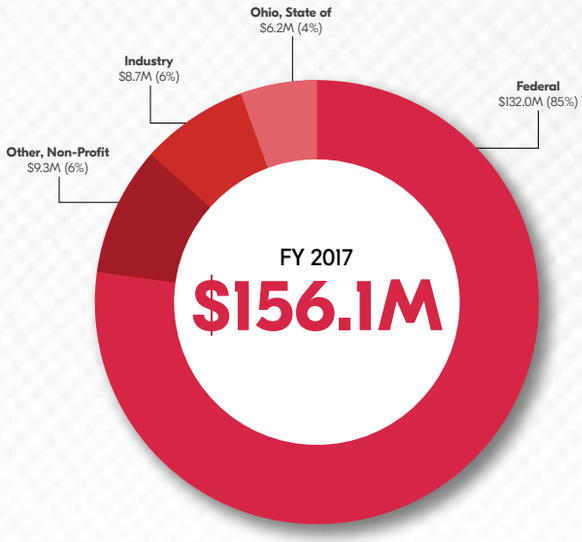
The designations and innovations officially place the university as a national leader in cybersecurity education and make the university eligible for government grants to further aid cyber security research, including collaborations with the Air Force Institute of Technology and a wide range of other institutional partners.

"We need an all-hands-on-deck approach," Harkett says. "You need political science, criminal justice and other behavior and social sciences teaming up with IT and computer engineering and science to ensure a well-rounded workforce that can protect the nation."

RESEARCH FUNDING SNAPSHOT

FY 2017 FUNDING OVERVIEW

Excludes Student Aid & Affiliate Data



1,485
Proposals Submitted

939
Award Count

2016 NSF RANKINGS OF RESEARCH UNIVERSITIES

Includes Affiliate Data

#35
Among Public Institutions

#52
Among All Institutions

HIGH-SPEED R&D

A team of University of Cincinnati students placed among the top 30 of 1,200 aspiring inventors in the first-ever Hyperloop competition in 2017. The competition to build a high-speed ground transportation system that relies on pressurized pods and travels inside a low-pressure environment was conceptualized by billionaire entrepreneur Elon Musk (CEO SpaceX & Tesla Motors). UC students took their prototype to California to compete and have launched their own start-up in Cincinnati to continue working on its development.

For a print copy of this report, please contact
Heather Geers: ***heather.geers@uc.edu***