

# Innovations

IN RESEARCH & CREATIVE WORKS



TEXAS A&M UNIVERSITY  
College of  
Architecture

FALL 2020

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**Front cover:** our design celebrates Texas A&M University's triple designation as a land-grant, sea-grant and space-grant institution.

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## ABOUT THE COLLEGE

Creativity, innovation and scholarly pursuits are the hallmarks of our programs.

The College of Architecture offers a top-notch education in a diverse range of disciplines that address critical, complex challenges in our natural, built and virtual environments. After graduating, students are equipped to become leaders in their fields and make a difference in the world.

Our undergraduate and graduate programs in architecture, landscape architecture, urban planning, construction science, land and property development, and visualization consistently rank among the best in the nation, topping lists of the most elite schools and standing out among costly private institutions. Our curricula include the traditional fundamentals of each discipline as well as interdisciplinary collaboration and high-impact learning opportunities such as study abroad, professional internships and lifelong support from the Aggie Network.

As part of a Tier One research institution, the College of Architecture provides undergraduate and graduate students with real-life and field experience working alongside faculty researchers in their labs, research centers and institutes, focusing on a variety of areas including healthcare facility design, housing, historic preservation, hazard resilience and recovery, and leadership in the design and construction industries.

College faculty, staff and students are committed to Texas A&M University's Core Values of excellence, integrity, leadership, loyalty, respect and selfless service. Graduates of our programs are highly sought after by industry leaders and graduate programs across the country.

Successful people start here.

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## From the Dean

Now, more than ever, our communities, nation and world need innovations in research and creative works to improve our quality of life, place and human endeavor. Our faculty are thought leaders in architecture, construction science, landscape architecture, urban planning and visualization. They are dedicated to pursuing innovative research and creative works that make an impact, and provide undergraduate and graduate students with unparalleled collaboration and experiential learning opportunities to better prepare the next generation of practice and academic leaders.

One of our highest priorities is to create a culture of inclusive excellence that leads to developing solutions for today's complex problems, and providing foundational knowledge to address the challenges of tomorrow. Our dynamic and imaginative community of scholars and artists engage in interdisciplinary research, outreach and teaching to address important issues such as social justice, sustainability, education, health and safety, and hazard reduction and recovery.

In this inaugural issue of Innovations in Research & Creative Works, you will meet faculty members doing transformative work on a broad range of topics. For example, you can learn about Francis Quek's research to improve teaching science, technology, engineering and mathematics concepts to minority and/or rural students who are typically underrepresented in these fields, and Johnathan Louie and Nicole McIntosh's exciting achievements in architectural design.

As we begin the 51st year of the College of Architecture, our challenge is to build on the success of the past, with an open mind toward the possibilities of the future. Faculty and students who are engaged in research and creative works will help lead the charge.

We hope you enjoy reading this issue, and that you will follow us on social media and visit our news website to keep up to date on the amazing work of our faculty, students and former students.



Dr. Jorge A. Vanegas

*Dean of the College of Architecture*

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# Five Questions

WITH DAWN JOURDAN, EXECUTIVE ASSOCIATE DEAN

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**1.** The public might not associate science with research in design and planning disciplines, but college researchers are leading numerous projects funded by the National Academy of Sciences and the National Science Foundation. What are some of the ways that science intersects with research in our disciplines?

The College of Architecture is comprised of faculty who engage in interdisciplinary research. Our scholars understand the role of the scientific method in conducting research and creating studies that can be validated and replicated. They also rely on the best available data as a basis for developing new knowledge and solutions. For example, our faculty are:

- researching complex urban and environmental processes like coastal preservation, disaster resilience and recovery, and how technology can improve urban life;
- studying how to improve K-12 STEM education and researching uses for artificial intelligence;
- creating evidence-based healthcare facility designs that improve patient outcomes, and learning how to increase buildings' energy efficiency;
- studying sustainability at the jobsite and throughout a structure's lifecycle, and learning how to build structures in near zero gravity-environments, and
- working collaboratively with leaders in Texas communities on engaged research projects to better understand and resolve issues these communities face.

These are just a few examples. Our researchers transcend traditional disciplinary boundaries to improve our quality of life, place and human endeavors.

**2.** Why does creative work matter?

One of the ways in which our scholars engage with the world is through the production of creative work. Creative work includes painting, sculpture, animation, game design, and other forms of making. We believe that the creation of this type of scholarship is a vital outlet for human expression, it reflects reality, and moves the hearts and minds of individuals and societies. We celebrate the importance of creative work in all we do. The spaces we inhabit in the college are filled with examples of these important works.

**3.** Do you think the public in general undervalues the importance of research?

The public interacts with research every day, often not knowing that the benefits they are enjoying are a part of academic endeavors led by teams of scholars. For example, researchers in our college have been actively participating in research that helps us understand the magnitude of the COVID-19 crisis and its local and national impacts. They have been looking at ways that design might be utilized to help minimize the risk of spreading the coronavirus and other transmittable diseases.

**4.** How can the college positively impact racial equality through research and creative works?

The College of Architecture, through its engaged research activities and creative works, plays a vital role in helping to cultivate racial equality across the state and nation. Many of our faculty work directly on issues relating to social justice. For example, our Center for Hazard Reduction & Recovery, Institute for Sustainable Communities, and Texas Target Communities program all work on projects that help identify and meet the needs of vulnerable populations in Texas. What is most significant about this work is that it is done in partnership with the residents of local communities across the state. We believe that this approach is game-changing.

Other researchers in our college strive to bring new forms of education into school systems across Texas. In the Colonias Program, the Institute of Technology-Infused Learning and the Institute for Applied Creativity, our faculty bring a culture of making and coding into many communities, providing advanced learning opportunities for youth of all ages as a part of their daily school curriculum. At the same time, our researchers are also learning what educational approaches work best in these areas.

The Center for Health Systems Design facilitates research on the effects of stress on patients' health and well-being, the design of indoor and outdoor healing environments, and the impact of design on infection control. Additionally, our faculty are working with the Texas Freedom Colonies Project to document the history of some of Texas' earliest African-American settlements developed by formerly enslaved people. As we preserve this important history, our college seeks to take what we learn to help cultivate a more inclusive future.

Whether developing solutions to the problems that vulnerable populations face, providing tangible assistance through our outreach efforts or giving a voice to those who may have difficulty being heard – our faculty, students and staff are helping to advance social justice.

**5.** If you could have dinner with anyone living or dead, who would that be and why?

I'd enjoy the opportunity to dine with environmental activist Greta Thunberg. As a young person and an advocate for future generations, she has captured the world's attention in ways that her adult counterparts have not been able to. I appreciate the way she utilizes science to formulate her approach to advocacy.





# Research

## EXPENDITURES & FUNDING

**\$5.8 million in external research funding**

### Research Impact

BY SOURCE

BY DEPARTMENT

Percent	Agency	Expenses	Tenure/tenure track faculty	Expenditure per tenure/tenure track	Department	Projects	Funding	
77.89%	TEXAS A&M/ SPONSORED RESEARCH SERVICES	\$3.98M	28	\$34K	ARCH — Department of Architecture	<ul style="list-style-type: none"> <li>Energy management</li> <li>Incorporating infrared thermography in historic preservation</li> </ul>	\$738K	
16.54%	TEES	\$845K	18	\$62K	COSC — Department of Construction Science	<ul style="list-style-type: none"> <li>Road construction zone safety</li> <li>Digitizing construction project materials</li> <li>Building life cycle energy use</li> <li>Accounting</li> <li>Construction in space</li> </ul>	\$1.2M	
0.57%	RESEARCH FOUNDATION	\$29.1K	24	\$69K	LAUP — Department of Landscape Architecture & Urban Planning	<ul style="list-style-type: none"> <li>"Green" infrastructure</li> <li>Texas Freedom Colonies</li> <li>Storytelling</li> <li>Quantifying effectiveness of private aid organization</li> <li>Disaster relief</li> </ul>	\$915K	
5.01%	TTI	\$255K	N/A	N/A	VIZA — Department of Visualization	<ul style="list-style-type: none"> <li>Video game development</li> <li>Discovering effective ways to teach tech-infused STEM in low-income K-12 schools</li> </ul>	\$2.5M	
					COLN — Colonias Program	<ul style="list-style-type: none"> <li>Community health worker training</li> <li>Promoting HPV vaccination</li> </ul>	\$501k	
100%	TOTAL EXPENDITURES	\$5.11M	TOTAL EXPENDITURES				TOTAL FUNDING	\$5.8M

Faculty in the College of Architecture, part of a Tier 1 research institution, conduct world-class, interdisciplinary research that impacts individuals, communities and the nation.

Their projects also enhance academic excellence, creativity and innovation while providing undergraduate and graduate students with opportunities to engage in research.

# Preserving Places

## CATALOGING THE CULTURES, NARRATIVES AND HERITAGE OF AFRICAN AMERICAN COMMUNITIES AND BEYOND

The idea was born in a cemetery.

As Andrea Roberts walked among the final resting places of her ancestors, she was inspired to embark upon a lifetime journey to help preserve and protect African-American cultural sites.

"It was Mother's Day and I went out to my family's cemetery where my grandmother and my great-grandmother are buried," said Roberts, who's now a Texas A&M assistant professor of urban planning.

"That day I saw one other person who pointed out where his family was," she said.

After a short discussion of family lineage, Roberts said she did not think they were related.

"Not that way," he said, "but we're related through slavery."

"That's where it crystallized for me," said Roberts, who went on to found the [Texas Freedom Colonies Project](#), a major initiative to preserve the heritage of the state's self-sufficient, all-Black communities that were established between 1865-1920.

As the leader of the project, Roberts draws upon her more than 12 years as a municipal administrator, where she learned firsthand about issues associated with Black community heritage conservation.

### CATALOGING HISTORIC BLACK SETTLEMENTS AND THE FREEDOM COLONIES

At the end of the American Civil War, approximately 250,000 formerly enslaved people in Texas, facing new and extraordinarily difficult circumstances, worked together after the Civil War and ensuing decades to establish self-sufficient, all-Black communities known by some as freedmen's settlements or freedom colonies.

Many of these communities are unmapped, absent from public record, or destroyed due to natural disasters, gentrification, and land dispossession. The communities that remain represent a crucial link

Urban planning professor Andrea Roberts, interviewing Wayne Sadberry, Brazos Valley African American Museum curator, is preserving African American places in the state as the founding head of the Texas Freedom Colonies Project.



between contemporary Black Texans and their family roots, said Roberts. In many cases, they are the last connections some African Americans have to their enslaved ancestors, cultural assets, and property.

Over the past two years, Roberts has brought her Texas Freedom Colonies Project [team](#), which includes faculty and graduate students, with her on her travels through Texas interviewing residents and their descendants to locate these freedom colonies and preserve the heritage of these communities.

Team members document the communities' historical and contemporary materials, recordings, photos and oral histories about settlements' origins, locations, challenges and promising preservation practices and upload these records to the project's [Texas Freedom Colonies Atlas](#), a website that analyzes collected data — surveys, archival material, images, stories, and public histories.

In addition to data uploaded by project team members, the site also collects crowdsourced data that will support freedom colony advocates, planners and cultural resource managers as they support community preservation and protection from development.

Since 2017, Roberts has mapped 357 of 557 known freedom colonies across Texas and has crowdsourced an additional 55 previously undocumented locations from the public.

“We’re trying to engage all the dispersed descendants of all freedom colonies,” Roberts said. “I want to make it known that freedom colonies are not just in the past, but that there are people still living there and engaged in these places and that we are committed to protecting them.”

Roberts said project findings can help [African Americans reclaim parts of their unrecorded past](#), learn new ways to protect their historical properties, and inform political decisions that affect the communities.

The project [website](#) allows communities to store historical and contemporary materials, recordings, photos and oral histories about settlements' origins, locations, challenges and promising preservation practices. The platform also supports freedom colony advocates, planners and cultural resource managers as they support preservation and protection from development.

#### **PARTNERING WITH STATE AND FEDERAL AGENCIES**

Helping fund her work is the 2020 [Whiting Public Engagement Fellowship](#), the 2019 [National Trust for Historic Preservation's](#) National Trust African American Cultural Heritage Action Fund Grant, and Texas A&M's [T3 Grant](#) and [Center for Digital Humanities Research](#) grants, among others.

In addition to funding COA student researchers, “our grants give us the visibility to tie us into national efforts to preserve historic places,” Roberts said.

Her team is partnering with historic preservation groups and other state and federal agencies, who use the atlas as a practical resource for development and infrastructure projects.

Recently, the team joined the Landowners Association of Texas and the [Texas A&M University School of Law](#), to develop webinars and workshops for landowners' estate planning. The sessions, which provide freedom colony residents with strategies to mitigate land loss, are funded by a grant from the [U.S. Department of Agriculture](#).

Other endeavors include working with complementary projects such as a [University of North Carolina at Chapel Hill](#) effort that seeks to map every African-American town in the U.S.

Roberts is also a 2020 visiting scholar at Yale's Gilder Lehrman Center for the Study of Slavery, Resistance and Abolition. Utilizing their archives, she is writing a book about Black historic preservation practice to be published by the University of Texas Press.

#### **ONWARDS TO THE AFRICAN DIASPORA, NATIVE AMERICANS, AUSTRALIA AND MORE**

Roberts said she wants her legacy to be about an approach to empowering people to make themselves visible and to have a say over what happens in their communities.

“Right now, it's African-American settlements, but I'm hoping this platform and approach are extrapolated around the planet,” she said.

“The next set of communities I want to work with is the African diaspora in the Caribbean. I want to look at how we're documenting and making visible Native American communities. I hope eventually there is a whole cadre of scholars who are doing the research I'm doing and an atlas and study in Australia using my methodology and approach.”

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By Sarah Wilson



Roberts and project members interview freedom colony residents and descendants, and document their work publicly in the online Texas Freedom Colonies Atlas.

Visualization professor Francis Quek is studying how to best teach STEM concepts to minority and/or rural students in Texas.



# Discovering the Best Tech-Infused Teaching Practices

## COLLEGE RESEARCH UNIT BRINGS TECH TEACHING TO UNDERSERVED SCHOOLS

K-12 educators have traditionally taught a curriculum of knowledge and basic skills such as reading, writing and arithmetic, to equip their students for their future livelihood.

But times have changed.

“Educators in 2020 also need to prepare students to work in an age where technical innovation will likely bring several waves of dramatic changes within the lifetime of an elementary school student,” said Francis Quek, founding director of the [Institute for Technology-Infused Learning](#), an interdisciplinary College of Architecture research unit whose faculty and student scholars are learning the best approaches to teach K-12 students in a tech-centered world.

“Reading, writing, and arithmetic education have to be paired with computer technology and science and perhaps most importantly, creativity, because our species is dependent on creativity to survive,” said Quek, professor of [visualization](#). “We are the only species that, when faced with something like the coronavirus, strives to create something like a vaccine. We are the creative species.”

These new teaching challenges raise a number of questions for educators: chief among them is, “what educational approaches work best?”

To address this question, Quek and a cadre of TITIL researchers are engaged in five projects with \$2.3 million in funding, most of it from the [National Science Foundation](#). In these projects, which are taking place in Bryan ISD and several rural Texas schools, they’re introducing science, technology, engineering and mathematics (STEM) concepts to minority and/or rural students who are traditionally underrepresented in these fields. At the same time, TITIL researchers are discovering how educators can best teach these concepts.

“Going forward, everyone in the workplace is going to need at least a basic level of technical competence,” said Quek. “No matter one’s role in the workplace, from entry level employees to heads of multinational corporations, everyone will need to understand how to engage with technology.”

In one TITIL project, Quek has teamed with Aggie faculty and

students in the departments of psychology and teaching, learning and culture, and teachers at Bryan’s Neal Elementary School to introduce third-, fourth- and fifth-graders to STEM concepts and activities.

“We’re evaluating various approaches through which young students may think of themselves as being interested in and capable of doing science,” he said.

“Such identity development may have a greater impact over time than learning any one piece of science in elementary school. If the children think of themselves as capable of and interested in science and technology, they may persist in learning STEM subjects as they continue in school,” said Quek.

Engaging in imaginative, technology-related activities may also connect participating students to the larger STEM community, “creating a sense of belonging in that community, and helping prepare them to more easily assimilate in a rapidly changing technological world,” he said.

In one of several public demonstrations of their work, Neal students created plastic cup robots that walk on Popsicle sticks, earthquake simulations and other projects including light projectors, chemical mixers, small heaters and more — all created with basic arts-and-crafts and electronics material and powered by simple household batteries.

They presented their projects to audiences at their school, at Texas A&M — and on a big stage half a continent away in New York City.

In March 2019, Neal fourth-graders made their science fair-



Elementary school students at Bryan's Neal Elementary get a hand from Quek as they develop an experiment

to continue the program after the funding ended," said Quek. "They came up with new funding to continue it because of the benefits it brought to their students. This is a very significant step toward sustainability, of research beyond the grant funding."

The successful partnership is also a model for what could be a widespread collaboration between school districts and universities.

"I believe this has the potential to be explosive," said Quek. "The median distance of anyone in America to a two-year college is eight miles. The median distance to a four-year college is 18 miles. Partnerships like

these could impact more than half of America's K-12 students."

#### WHAT ABOUT K-12 STUDENTS WHO LIVE IN REMOTE AREAS?

TITIL-affiliated students are helping with children in STEM classes in three small South Texas towns, but they've found limits to what they're able to teach online from College Station.

"To address this, we are building robots that will be operated remotely," he said. "That project is just now starting and we are building technology for it. It'll be a hybrid of remote learning and hands-on teaching. With this idea of instructors remotely operating robots, we

could possibly impact rural schools everywhere."

As TITIL scholars perform project after project, they are learning which educational approaches are the most successful.

"We are alongside teachers and students in the classroom. We are getting authentic educational experiences," said Quek. "We are learning firsthand what works, and what does not work."

By Richard Nira

like presentations at [Fablearn](#), a convention at Columbia University of STEM educators, researchers and policymakers from throughout the world who believe that children learn most effectively when they build tech-infused projects and share their experiences with their peers.

Convention goers got an up-close look at the results of TITIL's engagement and what its researchers are learning about the effectiveness of various STEM teaching approaches.

It was a memorable trip for the students at Neal, a school in a mostly minority, low-income area of Bryan. It was the first time most of them

had been in an airplane. During the trip, students also saw the sights: the Empire State Building, the Statue of Liberty, "The Lion King" on Broadway, and more.

TITIL also trains Texas A&M STEM students to work alongside Bryan ISD elementary school teachers in the classroom.

During a long semester, Aggie STEM students earn \$1500 to serve as Bryan ISD aids, providing technical science knowledge — computer programming, electronics, 3D design — that teachers may not have.

They represent majors from across

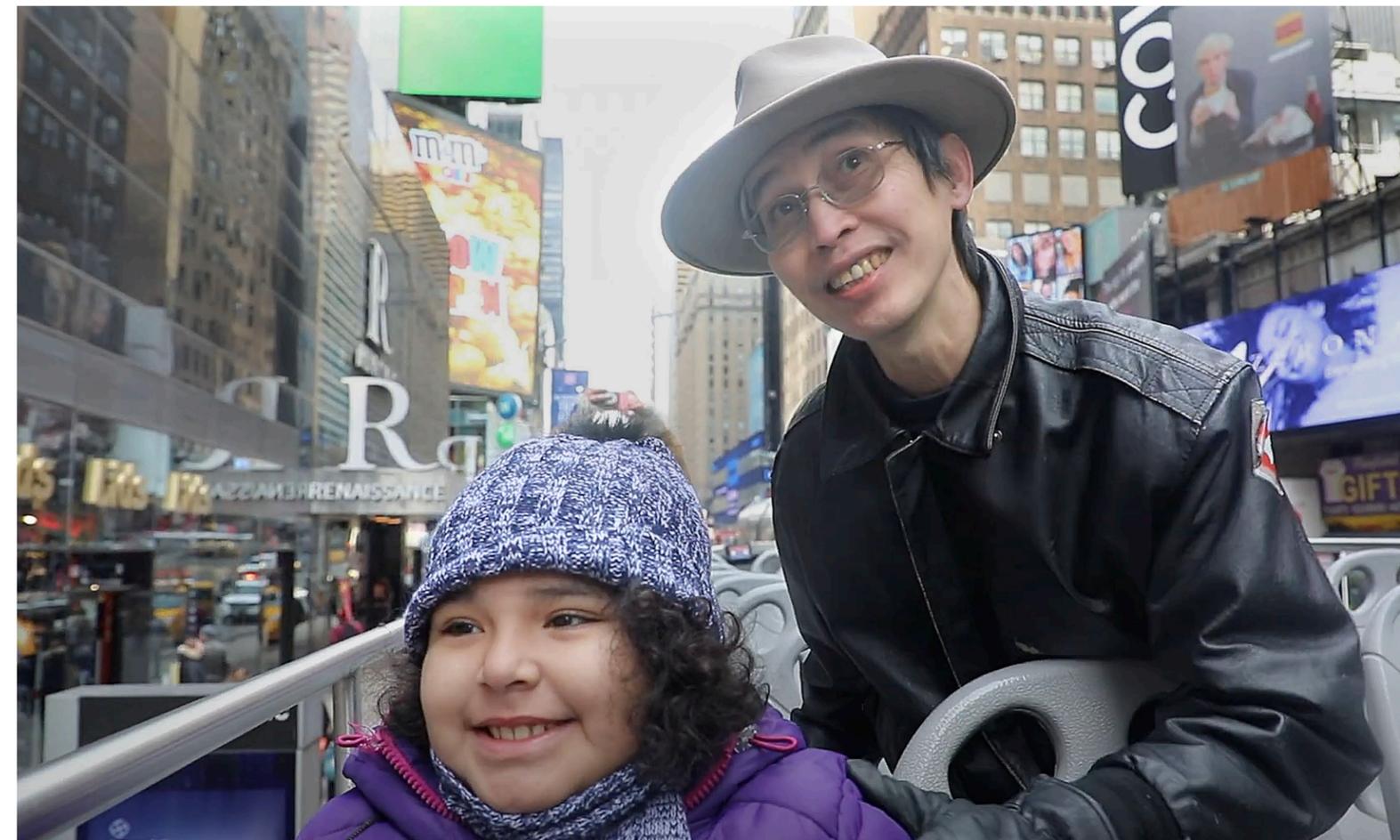
campus, such as engineering, biochemistry, computer science, psychology, visualization, and forestry, among others, said Quek. "I believe it is very similar to the Peace Corps, so I call it Mentor Corps."

"It's a classic 'win-win' situation," said Quek. "Bryan ISD students get enhanced STEM education, and Aggie students get what amounts to a scholarship every year."

The Aggie/Bryan ISD STEM collaboration could continue even after program funding runs out, said Quek.

"Bryan ISD administrators wanted

Quek led a group of Bryan ISD students to New York, where they presented their TITIL projects at an international educators' conference and saw the sights.





Construction science professor Zofia Rybkowski and a research team are exploring the possibility of buildings with “breathing” exteriors that are more energy efficient.

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# Buildings that Breathe

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COLLEGE RESEARCHERS EXPLORE FUTURISTIC BUILDING SKINS

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Buildings may one day “breathe,” and they might be able to function in their own environment with the help a type of “smart skin” developed by a team of Texas A&M University researchers.

The project, which includes College of Architecture researchers [Zofia Rybkowski](#), associate professor of [construction science](#), and Ergun Akleman, professor of [visualization](#), is supported by an approximately \$240,000 grant from the National Science Foundation. The goal of the research, the researchers said, is to make a building that is attractive and functional, but also more energy efficient.

Using what they call a “shape-memory polymer,” the team has developed building skins that could allow a building to breathe on its own, much like a living system.

“When it’s hot, we want the building skin to be open to absorb air, and when it’s cold, we want it closed, without using external mechanical devices or electrical devices,” said Ph.D. [architecture](#) student Maryam Mansoori, one of more than 60 Texas A&M students who are also heavily involved in the project.

The researchers are using materials including alloys and stimuli-responsive polymers to enable a building that has a “smart skin” applied to it to function almost as a living thing in its own environment.

“We started to think, can we create a system that is self-regulated based on the inherent properties of the materials themselves?” Rybkowski said. Builders and designers may be able to use heat or light to get the desired effect they want. The polymers are designed to draw fresh air into the

building, which allows it to actually breathe on its own.

Another team member, Negar Kalantar, assistant professor of interior design at the California College of the Arts, is using high-tech 3D printers to aid in the design and construction of the polymers.

Rybkowski said there are “lots of materials that are currently used that are responsive to environmental cues,” and the team hopes to identify these and more to use as smart skin building layers.

The key focus area of the project is sustainability, Rybkowski added.

“Can we use what already exists in our own environment and incorporate that into the anatomy of our buildings? That is the big picture here,” she said.

With more research, the team believes it can go farther and use materials that help self-regulate not only building temperature, but air quality and water conservation.

“Imagine buildings with smart skins that can perform the tasks of today’s mechanical, electrical and plumbing systems,” said Rybkowski. “This is a futuristic proposition, but a new generation of smart materials that can interact with the environment is starting to make this kind of vision feasible.”

The research team also includes Texas A&M’s Tahir Cagin, professor of materials science and engineering, and Terry Creasy, associate professor of materials science and engineering.

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By Keith Randall



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# Two Worlds, One Passion...

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## HIGHLIGHTING THE UNIQUE ARCHITECTURAL HERITAGE OF A WISCONSIN TOWN

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Deep in the Midwest, in what might be called the heart of middle America — a small town presents an architectural surprise: Swiss-style residential and commercial designs that line the town's main road, giving visitors an impression that they've arrived in a region of Switzerland.

This is the village of *New Glarus*, Wisconsin, a town settled by Swiss immigrants more than 150 years ago. Its design is the subject of research and a traveling exhibit created by Jonathan Louie, assistant professor of practice and Nicole McIntosh, assistant professor of architecture at Texas A&M.

McIntosh, originally from Switzerland, and Louie, a Hawaii native, came across New Glarus on a cross-country road trip, and inspired by the intersecting of the Swiss-American worlds, an idea was born.

The pair debuted their New Glarus research in an exhibition called *Swissness Applied* in 2019. It documents the village's unique architectural history and shows the combination of Swiss and American building characteristics. The exhibit is still traveling, and the research has now evolved into a book, to be published Fall 2021.

"The exhibit brings together two distinctly different audiences and it's personal for us too, given our Swiss and American backgrounds," said McIntosh.

"Swissness Applied" is part of a larger research project that focuses on the transformation of European immigrant towns in the U.S. and contributes to the ongoing discussion about cultural heritage and appropriation in architecture and urban design planning.

New Glarus is an example of one of these towns. Its architectural elements accessorize the buildings to create an attractive Swiss appearance for visitors. To curate this setting, the building codes describe typical elements of the Swiss Chalet style that evoke certain associations with familiar traditional Swiss building types. The exhibition questions the translation of the cultural image in architecture and illustrates through representational means the results and potential outcomes of embracing this image.

Along with their current research in New Glarus, the duo has had award-winning success in other projects, such as an experimental



and teaching design students.

Both professors teach architectural design studios as well as upper level seminars and focused research classes. Similar to their view of New Glarus, in their courses they enjoy exposing students to new ways of seeing and understanding the culture of a place.

The duo likes to test ideas borne in their classes in their projects, so students can gain experience both in and out of the classroom, and have the opportunity to see their handprints on some of the work that comes out of Architecture Office. Swissness Applied is an example of this, it began as a research seminar, then they hired previous students to help develop the exhibit.

“There’s a great reciprocal relationship between being in practice and being in academia,” Louie said. “You’re challenged in the best ways by colleagues and students, which in turn inspires your own work.”

“It’s always fun working with students that have so much passion for art and architecture.” McIntosh said. “It fuels my own passion and keeps me always thinking critically on how to best teach them.”

By Christina Lynne Davies

In addition to their research, Louie and McIntosh have teamed to design an award-winning workspace and All Square, a nonprofit organization that focuses on social justice.

design for a co-workspace called ShareCuse that creates custom mesh and metal cubicles to allow someone to be both alone and private, while still being able to see others in an office. This unique design inspires both interactive and independent work within an office.

Another example of their work is a nonprofit organization and restaurant in Minneapolis called All Square that focuses on social justice as well as explores the relationship between mirror images and reflections. The restaurant’s mission, centered on professional development, racial justice, and economic inclusion, is to employ and uplift formerly incarcerated individuals. The restaurant was also selected by Times Magazine as one of the Top 100 Great Places in 2019.

Louie knew at a young age that he wanted to be an architect. Raised by an architect father and a host of mentors, Louie earned a Master of Architecture degree at UCLA before he joined the Texas A&M faculty.

“I knew I was interested in

architecture from watching my dad,” he said. “But what really inspired me were the mentors in my life that got me thinking about all the possibilities.”

Half a world away in Zurich, Switzerland, McIntosh earned a Master of Science in architecture degree at ETH, a world class research university. She found a passion for art early in life and attended an art high school before going to college. She wasn’t fully satisfied in her art programs, however, and quickly moved to study architecture.

“I wasn’t satisfied being an artist,” she said. “Art and architecture are similar, but I found more excitement by interweaving complex teams and relationships.”

Early in their careers, Louie and McIntosh met at Syracuse University through colleagues when Louie was teaching and McIntosh was visiting for a final review. They found each other again a year later at the University of Pennsylvania, and already having a connection with similar architecture passions

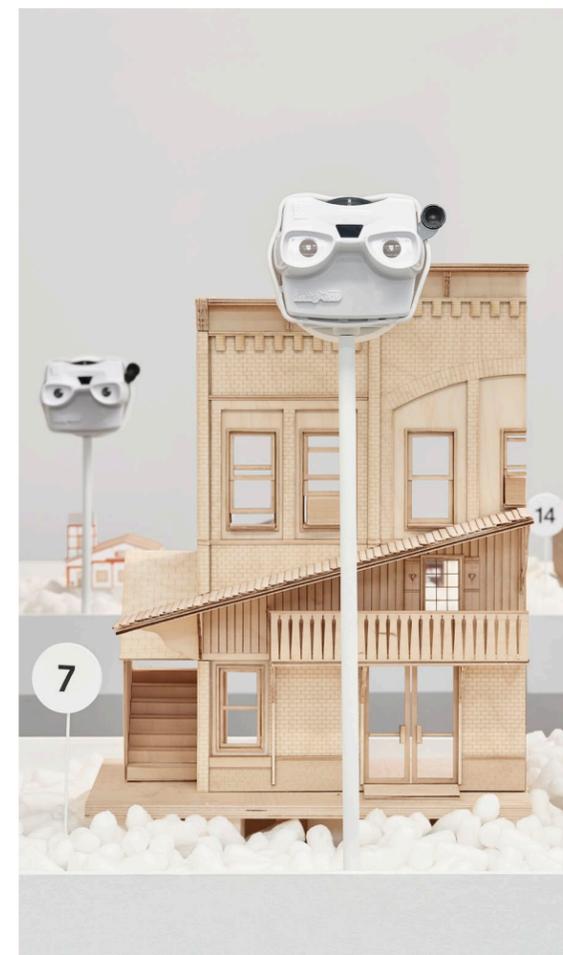
and career trajectories, they began working together.

“We entered a competition together, and that’s when we really started clicking,” she said. “Our partnership took off when we lectured together for the first time in New York after winning the 2017 Young Architects Prize given by the Architectural League of New York. We knew then we wanted to work together, both in practice and in academia.”

In 2015, the pair launched an architectural practice, Architecture Office. Inspired by their backgrounds and a passion to see art where art isn’t always recognized, the firm’s work embodies interdisciplinary efforts from artists, fabricators, and photographers, all working to realize their clients’ visions.

“We love working with many different kinds of people, cultures, and art forms,” McIntosh said. “I think that’s why Swissness Applied is one of our favorite projects.”

When the duo isn’t working hard at their studio, they enjoy working with



The “Swissness Applied” exhibit documents New Glarus, Wisconsin’s unique architectural heritage.

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# A 'Smart' Future

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SMALL TOWN HOPES TO BECOME 'SMART' CITY WITH HELP FROM TEXAS A&M FACULTY & STUDENTS

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"Smart" cities. They're places that promise big improvements in important areas: better traffic flow, improved public safety, better optimized utility systems, and many other public benefits from an extensive, high-bandwidth digital network.

But this vision invariably refers to large cities with resources to invest in expensive software and infrastructure. Could "smart" technology also improve life in smaller towns?

It's a question that Wei Li, Texas A&M associate professor of urban planning, is answering with ENDEAVR — an ambitious project he's leading in which more than 120 students from a wide range of university degree programs collaborated with residents in Nolanville, a small Central Texas town 10 miles east of Killeen, to help it take its first "smart" city steps.

Nolanville's forward-thinking residents have embraced the partnership.

"Working toward being a 'smart' city gives us an identity we didn't have before," said Kara Escajeda, Nolanville's city manager. "It means everything in the way of providing a cohesive vision and plan for our community to work toward."

Li launched ENDEAVR in 2018 with a \$300,000 grant from the Keck Foundation, which supports projects that promote inventive educational approaches. At the project's outset, students majoring in urban planning, landscape architecture, visualization, computer science, and civil, electrical and mechanical engineering gathered in seminars that covered the history of city development and learned how to shape proposals that spring from groups in different disciplines.

These seminars also prepared them for an intensive envisioning process with Nolanville residents, who provided ENDEAVR students with specific ideas about improvements and concerns they had about their community.



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Jaimie Masterson of the college's Texas Target Communities and Wei Li, associate professor of urban planning, are heading an ambitious, interdisciplinary project to help the small town of Nolanville, Texas become a "smart" city.



Li will also be researching how a semi-autonomous vehicle affects the mobility of Nolanville residents without easy access to vehicle travel.

At the end of the spring 2020 semester, undeterred by the coronavirus pandemic, students presented “smart” city ideas for Nolanville via online presentations to community residents based on the envisioning process.

Escajeda, the city manager, was especially intrigued by students’ concepts of a train notification system. Train tracks run right through the middle of town, regularly causing delays and frustration for Nolanville motorists. “A couple of teams came up with notification system ideas, including an app-based alert system,” said Escajeda.

Another group proposed a district that would incentivize the establishment of high-tech startups or established companies. “One team proposed a district that included a smart city museum, a possible high-tech replacement for a traditional library, which is a very clever idea,” she said.

**“SMART” VAN TO HELP RESIDENTS WITH MOBILITY ISSUES**

Another aspect of the ENDEAVR

project will become a reality this fall: a van that, for the most part, drives itself and will ferry residents lacking easy access to vehicle travel — senior citizens, disabled citizens, and others without transportation — to appointments and other trips. A volunteer operator in the driver’s seat will guide the van through parking lots; other than that, the van, using a publicly available guidance system, will be on its own.

“The vehicle will also be equipped with mobile telemedicine facilities so that patients without internet access at home will be able to see a doctor virtually and safely inside,” said Li. “Residents and leaders in Nolanville are eagerly expecting this part of the ENDEAVR project stage.”

Self-driving, or autonomous, vehicles have been in various stages of development and testing for several years. Such vehicles promise to make transportation more readily available to the more than 75 million people in the U.S. who lack everyday transportation options.

“There are 25.5 million Americans with travel-limiting disabilities,

29.8 million people age 75 and up for whom driving might be a considerable safety risk, and 20.6 million Americans who live in households without cars,” said Li.

A significant hurdle to providing transportation relief to people in these demographics are the high prices that are common for autonomous vehicles.

But there are lower-cost options available, including relatively affordable kits that enable a mechanic to convert a standard vehicle into a semiautonomous car in just a few hours — the kind of vehicle that is part of the ENDEAVR/Nolanville project.

After a fall 2020 test of the semiautonomous van, ENDEAVR-affiliated scholars from several disciplines will assess how it affected users’ mobility, what kind of trips they used it for, and overall, how it affected their lives.

**STUDENT/COMMUNITY PARTNERSHIP PAIRS PROBLEMS WITH NEW SOLUTIONS**

To further strengthen Texas A&M’s collaboration with Nolanville, the

ENDEAVR project also includes participation from Texas Target Communities, a College of Architecture outreach initiative whose urban planning students assist small communities that lack full time urban planning staff.

The spring 2020 collaboration moved online after a February event in the city’s Monarch Park where ENDEAVR and TTC students provided tech demonstrations and gathered ideas from residents about future improvements.

“We assigned an active community resident to each student group,” said Jaime Hicks Masterson, TTC associate director. “The resident served as a group mentor and a go-to person for students’ questions about Nolanville’s current conditions and needs at the Monarch Park meeting and follow-up virtual meetings. They provided lots of great feedback, knowledge about local conditions and the challenges their community faces.”

Based on this input, students crafted concepts and presented them online to community members for possible inclusion into an update of the city’s comprehensive plan — a document approved by city policymakers that guides a community’s development.

“There are proposals for waterway improvements to prevent and/or reduce flooding in a creek that runs through Nolanville, a new commercial area downtown, a park dedicated to bird watching, and many more,” said Escajeda. “We will add nuggets from each of the student presentations and put them into various chapters of a Nolanville comprehensive plan update.”

That seemingly small item — putting these ideas in an update of a comprehensive plan — is a really big deal.

To understand how important this is, it’s helpful to go back to 2013, when the Texas Target Communities

partnership with Nolanville began.

Funding community initiatives with urban planning

Back then, Nolanville typically issued bonds for city improvements. “Bonds help get projects completed, but they also create a long-term financial burden on a community,” said Escajeda.

At the time, the city was looking to create a new comprehensive plan. TTC students fulfilled the role of city planning staff, creating proposals after learning about the city’s needs in meetings with residents.

Many of their proposals for city improvements were included in the comprehensive plan, which was approved by the city in 2014.

“Because those proposals were in the plan, we received grants for a number of projects instead of issuing bonds for them,” said Escajeda. “Their inclusion in the plan showed funding agencies and organizations that the proposals had the community’s support.”

It was the first time the city had undertaken projects with grants instead of bonds. Within five years of the comprehensive plan’s adoption, the city received 11 grants totaling more than \$2.6 million, said Masterson.

These grants funded public projects that significantly improved pedestrian and bicyclist safety, created a new splash pad, financed numerous city

park improvements, and other new city amenities.

The partnership is the very definition of a win-win scenario, said Masterson.

“Nolanville city officials said students presented a wealth of innovative ideas this spring that can be included in an updated comprehensive plan,” she said. “The town is becoming a regional leader in community action and ‘smart’ city ideas.”

Students are also learning how to work with residents to bring funded improvements to the community.

“The partnership is yet another example of how planning can alert residents and youth to the possibilities of the future,” said Masterson.

This sizable undertaking couldn’t have taken place without a sizable number of faculty from several departments: Anatol Bologan, instructional assistant professor of visualization; Tyrene Calvesbert, visiting professor of architecture; Theodora Chaspari, assistant professor of computer science & engineering; Chanam Lee, professor of landscape architecture; Kiju Lee, associate professor of multidisciplinary engineering technology and industrial distribution, and Sivakumar Rathinam, associate professor of mechanical engineering.

Masterson oversees planning students’ interactions with residents looking to update their town’s comprehensive plan.

By Richard Nira



# Improving Lives of Texans Along the Border

## TEXAS A&M'S COLONIAS PROGRAM WORKS WITH PUBLIC AND PRIVATE AGENCIES TO LIFT COLONIAS RESIDENTS

In more than 2,000 colonias — informal settlements that dot the long border separating Texas from Mexico — many Americans live in neighborhoods laced with unpaved roads, in homes without running water, electricity, or storm drainage.

“When we talk about third world conditions, everybody

automatically thinks about Mexico, Africa, Haiti,” said Oscar Muñoz, director of the Texas A&M College of Architecture’s [Colonias Program](#). “They never think that it’s right here in our backyard.”

Approximately half a million people, most of them Hispanic, live in colonias along the 1,254-mile Texas-Mexico border, and half of those residents are under age 18.

Because of their remote locations, low incomes, and language and cultural barriers, colonias residents tend to be isolated from government services and social safety nets that provide education, job training and placement, health care, and programs for the young and elderly.

These factors can also make it harder for them to access medical, legal and other services and raises their vulnerability to predatory practices.

“We are in communities that have a lot of needs, but the Colonias Program is constantly trying to find ways to improve residents’ living conditions, to improve their way of life,” said Muñoz.

Many believed they were getting a bargain when they

Colonias Program director Oscar Muñoz regularly travels the 1,254-mile Texas-Mexico border to help improve the lives of Texans living in colonias.



A mobile clinic brought to the border area in a partnership between the Colonias Program and Webb County officials hosted a health clinic in January 2020.

settled in colonias, whose origins date to the late 1950s. Colonias populations saw significant growth spurts due to economic conditions in the 1960s and 1990s.

Whatever the era, the colonias story is similar: people acquired relatively cheap land outside settled areas they were told would soon receive at least basic infrastructure (electricity, sewer, water, roads, etc.) common in U.S. subdivisions.

I think the colonias became very profitable because unscrupulous developers were selling the American Dream,” said Muñoz. “Developers said ‘I’ll let you buy land, and you can pay me on an ongoing basis.’ But what’s not being told is that they might be paying 25% interest. They’re being taken advantage of.”

The Texas Legislature recognized the need for intervention by establishing the program in 1991 and asking the College of Architecture to oversee it.

Aiming to reduce colonias residents’ isolation, increase their self-sufficiency and enhance the quality of life in these communities, the Colonias Program partners with a wide variety of public and private agencies to provide GED instruction, economic and community development assistance, literacy and job training, high school dropout prevention, job referrals, health education, and much more.

Program administrators, based in three regional offices and a main headquarters in San Antonio, often act as “matchmakers” in the sense that they connect colonias residents to social service agencies or initiatives.

In 2019, for example, Muñoz learned that Texas A&M students in BUILD,



a student-led organization at Texas A&M that transforms shipping containers into mobile medical clinics, was soon to finish a new pair of clinics.

Realizing that such a clinic would be ideal for colonias residents who lived near Laredo in Webb County, Colonias Program administrators “matched” the county with the BUILD students and helped make arrangements to transport one of the units to Webb County.

County health employees began serving residents in the clinic, which provides an environment for basic medical services, in January 2020. The clinic supports public health by bringing services to colonias residents who may lack transportation to nearby urban areas.

BUILD is partially supported by the [Department of Construction Science’s Construction Industry Advisory Council](#).

Another example of the program’s “boots on the ground” approach is its training of promotoras, a key feature of the Colonias Program.

Promotoras, many of whom are colonias residents, are trained to

provide a neighbor-to-neighbor service connecting residents with the many social services available from public and private organizations.

“A promotora serves as a union between an agency that can help families and residents that don’t know about the agency’s resources and services,” said Nancy Martinez, a promotora and colonias resident.

The program’s promotora concept is a “grass roots” method that spreads the knowledge of available services throughout the colonias.

“By training local residents to learn how to navigate different social service systems you’re building up the colonias from within,” said Muñoz.

Promotoras become trainers of trainers, he said, paving the way to train new generations how to improve their lives and better provide for their families.

“I think we all have a promotora inside us,” said Martinez. “The majority of us want to help our neighbors, to share the good things you know, and what you can offer.”

By Richard Nira

In her paintings, visualization associate professor Felice House challenges traditional gender roles.

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# Redefining gender roles:

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## CHALLENGING STEREOTYPES AND BIAS THROUGH ART

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A woman clad in Old West clothing topped by a cowboy hat exudes self-assuredness and swagger as she stares out onto a deserted plain. She sits leaning back, her vibrant red boots propped up from the back seat of a dusty car as it carries her past a ranch house. It's a shot right out of a typical western film with one big difference — the hero's gender.

The cowgirl, dubbed "Julia Dean," is an oil painting that reimagines the poster for "Giant," the iconic cowboy movie starring James Dean.

It's just one in a series of large-scale paintings created by Felice House, a figurative painter and Texas A&M associate professor of visualization, recasting women into western movie roles exclusively played by male actors like John Wayne and Clint Eastwood.

Using environments like the western genre that are so familiar and established around the globe, House recasts the lead roles with strong, contemporary female heroes, subverting outdated and offensive gender power dynamics in culture.

"I actually love the genre," she said of western flicks. "The music, the boots, even the movies and soundtracks, the idea of the hero and the villain."





Students learn from House in a Langford A painting studio.

But House said the roles in westerns are totally inaccessible to her and that watching them is frustrating. In these films, with few exceptions, women are featured only as nonautonomous barkeepers and prostitutes: props for the male character's pleasure, a weaker person needing to be saved, or a prize to be won.

She wanted to appropriate and reinterpret the setting, showing powerful women as the lead protagonists and challenge the cultural norm that masculinity is intrinsically linked with heroism.

#### "COWGIRLS" AND MODERN CULTURE

Simply Googling the term "cowgirl" made it clear how much women in westerns needed a rebrand, said House. The top search results are for sexual positions, and the image tab shows scenes that are less than empowering to women.

"I was totally alarmed at the oversexualized images of cowgirls," she said. "These heroes for women have been completely usurped by male fantasy and pornography."

Struggling to change this perception, her cowgirl series went through many stages as House attempted to create powerful images of cowgirls to counter oversexualized portrayals of women in culture.

"All I could get were these saccharine images that weren't very powerful, and I couldn't figure out why that was happening," she said of the first stages of the series.

House found the solution to her problem through a lot of trial and error. In a moment of amusement, House jokingly photoshopped a woman's face onto an iconic picture of John Wayne. And somehow it just ... worked.

"It was so hysterical, but also

powerful," she said. "We understand this character of John Wayne as a power icon in culture, and this piece somehow referenced him but allowed that power to be transferred to a woman and put her in that position of power."

#### RECASTING THE HERO

And thus "Re-Western" was born. Because those images are already imbued with power and strength, simply by changing the gender of the subject the power of the image was transferred in a compelling way.

The women in House's paintings, who are live models, also aren't portraying men. They're portraying cinematic heroes, situating themselves as the rightful players in the story if they had been originally cast.

It was a collaboration between artist and model as they discovered how to invoke the poses, facial expressions and vibe of the hero in each scene. The process required experimentation and negotiation to create an end product that feels familiar, iconic and powerful.

"I would argue that in today's culture portraying women without objectifying them is an intentional and political act," said House. "The art historical and current cultural norm is to portray women to extol their sexual beauty and to encourage possessiveness. For centuries men have painted images of women for men. Now that women have access to education and training, women are painting women as we see ourselves."

#### BEYOND THE WESTERN

In addition to creating new paintings for "Re-Western," House created "Face West," a spinoff series painted in the same style but focused on the

House's work has also been displayed at the College of Architecture's Wright Gallery.



subject's expressions and emotions.

House's work has exhibited in museums and galleries across the country, as well as internationally. It can be found in public and private collections, including The Booth Museum of Western Art, Austin City Limits Music Festival, Prentice Women's Hospital, and American Campus Communities. She has been featured in multiple publications, including Fine Art Connoisseur Magazine, Vice Magazine's The Creators Project, the BBC News, Upworthy, Hypertext, Refinery29, El Diario in Spain and Tabi Labo in Japan.

With her many traveling shows and multitudes of media coverage, House continues to receive numerous acclamations and personal messages praising her art and what it stands for.

Currently, House is continuing to show her "Face West" series across the U.S., with a recent exhibit in Lockhart, Texas.

By Christina Lynne Davies

House's work has been viewed by audiences at exhibits in numerous galleries.



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# Turning Back the Tide of Flooding

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RESEARCH FINDINGS POINT THE  
WAY TO DEAL WITH FLOODS

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Flooding is the most disruptive natural hazard in the U.S. it's also an issue of great significance in Texas, whose Gulf Coast region is home to 7 million people — a population greater than 35 of the U.S. states.

The potential for another Hurricane Harvey-like disaster is ever-present. The hurricane's catastrophic damage, spread through a 49-county area, ranged in the hundreds of billions of dollars; the damage was exacerbated by decades of development in low-lying coastal areas.

## RESEARCH LEADS TO ANSWERS

The best response to flooding is a coordinated group of local, regional and national-scale, evidence-based solutions, said Galen Newman, an associate professor in the Department

of Landscape Architecture and Urban Planning and Director of the Center for Housing and Urban Development.

Newman is part of a sizable band of researchers seeking flooding solutions as part of Partnerships for International Research (PIRE), a massive, \$3.5 million, five-year initiative funded by the National Science Foundation that includes faculty and student researchers from Texas A&M, Rice University, Jackson State University, and TU Delft in the Netherlands, a nation that has fine-tuned flood mitigation techniques for centuries and is considered the world's flood prevention leader.

In addition to collaborating year-round with Netherlands flood reduction experts, Newman, with other PIRE-associated faculty,

accompanies 15 Texas A&M students to the Netherlands each summer as a part of the PIRE program to conduct flood reduction research with his guidance. (The trip was suspended in 2020 due to the coronavirus pandemic.)

## ONE SIZE DOESN'T FIT ALL

Part of the complexity of implementing flood reduction measures is that there's no "one-size-fits-all" solution, said Newman, who heads the Texas A&M Department of Landscape Architecture and Urban Planning's PIRE engagement. There's a variety of measures, such as engineered structures — levees, dikes and seawalls — as well as "green" infrastructure, including wetlands and detention ponds.

There's also a difference in project size: large scale, such as the previously mentioned dikes; medium scale, such as a park or riparian zone instead of a housing or commercial development in a flood zone, and small scale, such as rain gardens or a bioswale — a landscape element with gently sloped, vegetation-filled sides that removes silt and pollution from storm water runoff and routes it to larger waterways.





Flood researchers including Galen Newman of the Department of Landscape Architecture and Urban Planning are learning there's no "one size fits all" solution to flooding.

Ideally, these measures all work together, conveying ordinary amounts of storm water to a designated area for holding or funneling to other channels. In the case of storm water overflow, instead of inundating homes or businesses, it should get funneled to other channels until it is eventually washed into a lake, reservoirs or other bodies of water.

"The intent is to also slow the volume of storm water runoff and capture as much as you can to increase its ground absorption," said Newman. "You're looking to reduce the amount of impervious surfaces such as parking lots, which are a significant contributor to urban flooding."

**"DOWN-HOME" SOLUTIONS**

Newman has applied his PIRE-related research findings to Texas projects.

In one study, Newman explored and devised enhancements for integrating the previously proposed Ike Dike – a proposed clay-core dune running along Galveston Island and the Bolivar Peninsula with two large-scale floodgates at opposite ends of the island – into

the landscape, with less visual and spatial disturbance. The dike's proponents see it as a protection mechanism from Galveston Island floods, but the dune, if not integrated correctly, could also become a visual and social barrier that decreases beachfront connectivity and walkability and fragment animal habitat areas.

Newman recommended incorporating elements that would improve the dune by providing economic and social benefits to the area while enhancing the dunes' flood reduction effectiveness, that include the placement of:

- flood 'overtopping' detention areas behind the dunes that would attract wildlife and absorb unblocked storm surge;
- retail spaces, such as cafes and beach equipment rental businesses, between the beach and the dunes;
- green spaces with bicycle and pedestrian lanes atop and across the dunes, and
- native plantings to protect the stability of the dunes.

In another project, PIRE-affiliated graduate landscape architecture student Zixu Qiao created an award-winning design proposal in 2017 of a medium-density development at a 97-acre site in coastal League City, Texas that is highly vulnerable to flooding and sea level rise.

Her concept's main feature is a large, central preserved wetland that serves as both a recreational area in dry times and a flood zone during heavy rains or a storm surge. The space's numerous amenities include a boat launch, a recreational pier and walking paths. A gate protects the development from adjacent Clear Creek floodwaters and a built slope covered with vegetation mimics a natural levee.

The green space is surrounded by residential and commercial areas with permeable paving and bioswales.

Her plan earned a highly coveted 2017 Student Honor Award from the American Society of Landscape Architecture. The award is one of the most competitive and prestigious awards a landscape architecture student can earn, said Newman, who chaired Qiao's final study committee.

Newman's research also informs his green landscape performance modeling — virtually increasing an existing design's "green" infrastructure by a predetermined amount, and then seeing how much the flood and storm water associated with the design decreases.

"With this kind of modeling, we can advocate for the inclusion of 'green' infrastructure because we have data to show how, together with new land use procedures, it makes a real reduction in Gulf Coast flooding," said Newman.

Sometimes Newman will also conduct scenario-based approaches.

In Houston and in Amsterdam, Newman, with assistance from Youjung Kim, a Texas A&M urban planning faculty member, has modeled future growth based on existing growth patterns to show where new buildings will most likely be developed, and how many of those buildings will be in a future floodplain to help public officials create land-use policy.

**HURDLES TO IMPLEMENTING SOLUTIONS**

For evidence-based research findings to shape policy, however, action is required by policymakers.

Voluntary, government-sponsored buyout programs of lands in Texas coastal floodplains are a start, he said, but their effectiveness is limited because of the understandable desire of landowners to maximize their land's development potential.

In Houston, Newman said, policymakers have adopted land-use guidelines for certain kinds of development to reduce flooding, but only a handful of permits following these guidelines have been issued.

A significant step in this direction, said Newman, would be to greatly increase landowners' incentives to build on their land with flood reduction measures in mind. "Incentives such as fast-tracking the permit process, waiving building permit fees, tax breaks, and others could be introduced or increased," he said.

The forecast? More rain is coming. How much, and when? That's unknown.

By Richard Nira

It's no simulation, it's his residence — architecture professor Charles Culp is testing a heating, ventilation and air conditioning system at his home.

# Homework

RESEARCH AIMS TO IMPROVE RESIDENTIAL ENERGY EFFICIENCY AS WELL AS HOME AND HUMAN HEALTH

Architecture professor Charles Culp, who studies residential and commercial buildings' energy efficiency, literally takes his work home with him.

"My wife and I built an experimental house that we are living in," said Culp, holder of the Mitchell Professorship in Residential Design. "I believe I need to live inside the research I do to truly understand and feel how things are working. Simulations are great, but the answers they give can have a pretty wide error range."

As the innovator and designer for the home, Culp envisioned a structure that balanced energy efficiency with comfort and sustainability. As a continuous improvement

project, the home's evidence-based design incorporates common-sense strategies and proprietary technologies. Culp's wife, Bonita, recently earned a MS from the Department of Architecture studying healing gardens. She is a degreed horticulturist and has done all of the zero-water use landscaping on the surrounding lot. She also designed the interior and the atrium's interior.

"We built the house with high windows and a southern exposure to take advantage of sunlight," said Culp. "Our home has more natural light, so we use less electricity. Energy efficiency is the lowest cost energy we can find, so we designed it with that in mind." Careful selection of

building materials, heating and air conditioning units and other appliances has delivered impressive early results.

"Energy efficiency can be measured in KBTUs, which is 1,000 British thermal units per square foot per year. Typical houses built today range from 35 to 70 KBTU per year. The American Institute of Architects say that we need to be around 14 by the year 2030," Culp said. "Once we were in the house for several months and saw how everything was working, we made some adjustments. Now we are now running at 17 KBTU per year, so we are doing well."

Energy efficiency is dependent on many variables, most of which can be thoughtfully influenced in new construction or improved in existing structures. Culp's research focuses on the costliest variables — heating and air conditioning — to generate positive gains in household energy use. He credits the Mitchell Professorship in Residential Design for advancing his residential research. "About 10 years ago I began researching energy efficiency in residences," Culp said. "The professorship provides resources that support students, innovate efficiencies and simulate the outcomes."

Modern heating and air conditioning rely on raising or lowering the temperature of air, and mechanically moving it to where the comfort is needed. A typical home may have one or two thermostats which control the temperature of multiroom sections of the living area, resulting in heating or cooling rooms that may not be in use. To address this inefficiency, Culp is developing partial use, partial conditioned (PUPC) technology, which he hopes to implement in the house soon.

"The idea is that at any given point in the day, we may only occupy one or two rooms in our home, so why cool or heat the entire living space to the same temperature?" he said. PUPC technology facilitates the movement of cool or warm air around the living space, targeting specific rooms, based on occupancy. For example, at night bedroom temperatures can be set for comfort, while vacant room temperatures can fluctuate to increase efficiency. In the morning, bathrooms, kitchen and other day-use space temperatures can be adjusted for comfort as needed. The ability to move air from room-to-room provides other benefits as well.

Culp built an atrium in his concept house which will play an important role in both energy efficiency and in human health. In Culp's PUPC house, air will cycle from the outside, be cooled or heated as needed and then moved into occupied space. Once the air warms above the desired temperature, it will be moved again into the atrium.

"I call it a jungle because we have so many plants," said Culp. "The tropical plants in our atrium benefit from the slightly warmer air, which is pushed outside once it exceeds the desired range, and we benefit from living with plants."

"Evidence-based research findings support the trend in healthcare to create medical campuses with healing and meditation gardens," said Culp. One of the earliest studies, by Dr. Roger Ulrich, a former Texas A&M professor of architecture, looked at patients in a Pennsylvania hospital who were recovering from gallbladder surgery, which was at the time considered major surgery. The 1984 article, published in the journal *Science*, showed that patients whose windows overlooked trees healed, on average one day faster, needed less pain medication and had fewer post-

surgery complications than those whose view consisted of a brick wall. “If plants have such a positive impact on patient recovery, why not apply their benefits to healthy people to keep them healthy?” said Culp.

In addition to the comfort and health of residents, PUPC can also aid in the health of the home itself.

In the summer, when a residential wall separates the hot and humid outside air from the cooler, dehumidified inside air, Culp says a perfect storm is brewing. “Most houses create a negative pressure in the home, which pulls outside air and humidity through the wall,” Culp said. “When the dew point and temperature inside the wall match, condensation forms, and often leads to mold growth.” Mold can cause serious structural damage to a building and jeopardize human health.

The use of PUPC positively pressurizes the house, creating slightly more pressure inside the house than out, pushing the dry air through the walls, which dehumidifies them. That helps mitigate mold growth behind sheetrock, keeping the residents and the house healthier.

“We need to change how we think about energy,” said Culp. “We must develop better strategies and technologies that can work in both residential and commercial spaces, to improve efficiencies and human health and well-being.”

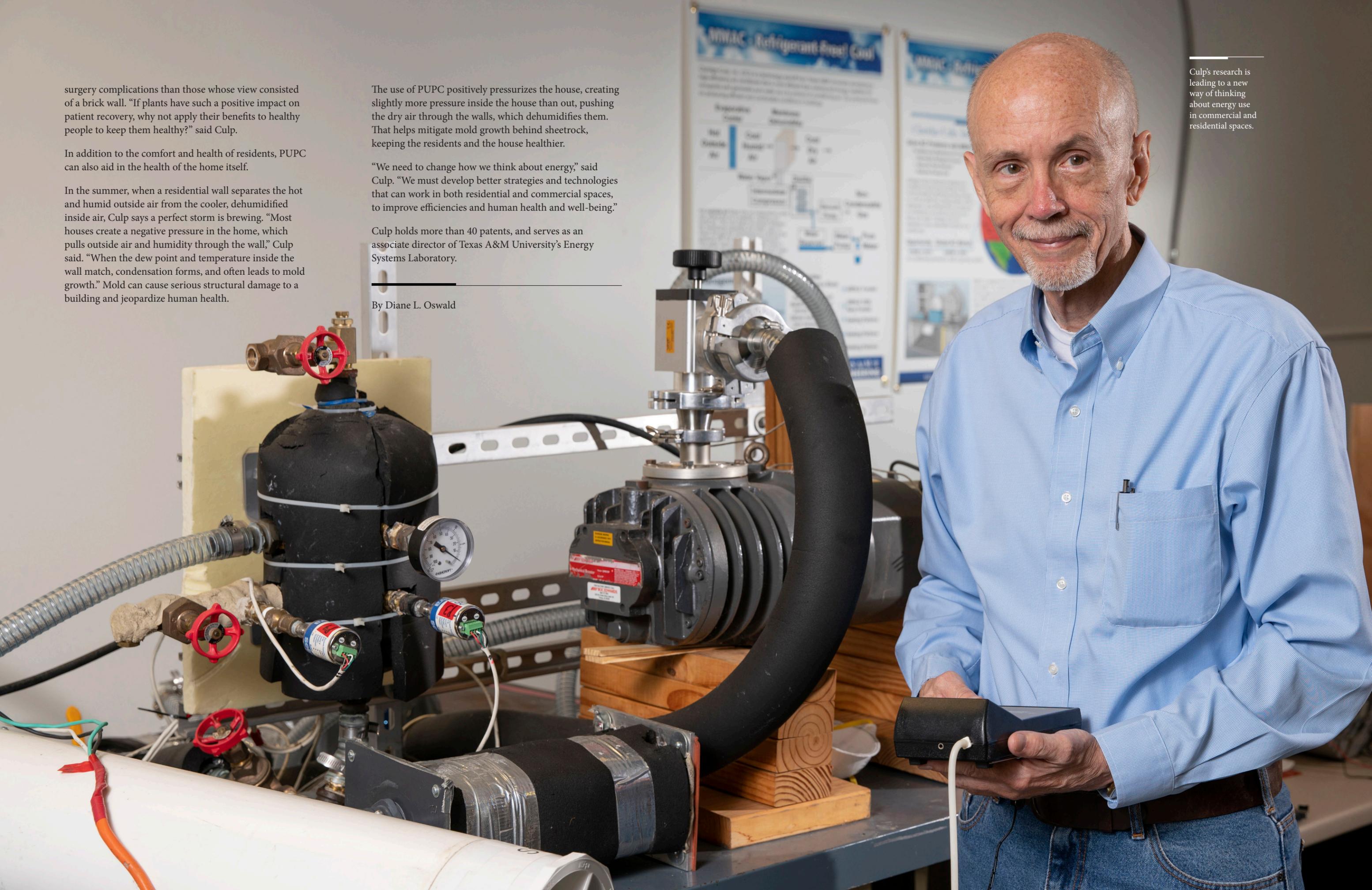
Culp holds more than 40 patents, and serves as an associate director of Texas A&M University’s Energy Systems Laboratory.

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By Diane L. Oswald

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Culp’s research is leading to a new way of thinking about energy use in commercial and residential spaces.





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# Disaster Response and Planning

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TECH, TENACITY AND TRIUMPH: HOW NEW MEDIA AND VOLUNTEER GROUPS ARE SAVING LIVES

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In the midst of a disaster, when emergency services are stretched thin, everyday people are rising up to help their neighbors in organizations that perform life-saving rescue and aid efforts using social media and other digital technologies.

Michelle Meyer, director of Texas A&M's [Hazard Reduction and Recovery Center](#), studies these volunteer groups. Her findings could help these groups and their communities come up with better ways to dispatch help, target resources to neighborhoods historically ignored, and do pre- and post-disaster planning and recovery for emergencies including hurricanes, floods, COVID-19 and future disasters.

Funded by [National Science Foundation](#) grants totaling nearly \$650k, Meyer is studying the evolution of these volunteer groups after disasters, how they use social media and technology to coordinate efforts and how communities can best harness philanthropic resources to help long-term, post-disaster recovery.

The eight volunteer rescue organizations Meyer and colleagues at LSU are studying are often referred to as the Cajun Navy and assumed to be one organization. This movement of many groups include volunteers that sprang into action after Hurricanes Katrina and Harvey to rescue thousands of people from flooding using their personal boats and, later, social media apps to organize rescue attempts.

“People who have boats have always gone out and rescued their neighbors,” she said. “But the 2016 Louisiana floods



Michelle Meyer, director of the Hazard Reduction and Recovery Center, is studying the emergence of volunteer organizations' rising role in disaster rescues.

marked one of the first times people were posting their addresses on social media asking for help. Hurricane Harvey was similar.”

Meyer said it's possible that these organizations, which disaster scholars call “emergent groups,” traditionally disbanded after disasters passed, but continue to exist now because of social media.

After Harvey, some of these rescue groups created formal nonprofit structures, trained members in emergency management systems, continued to aid in community needs, and coordinated their efforts using social media and various new apps.

“They use Slack, Zello (a walkie talkie app), Microsoft Teams, all these different apps. Some are building their own apps or helping startup rescue groups test theirs,” Meyer said. Smartphones now allow for better real-time geolocation of people who are in a need and those who can help.

You can track team members' locations, which in a rescue situation is very important.”

### RESPONDING TO THE PANDEMIC

“Several of these organizations are responding to COVID-19 by making masks and delivering food,” she said.

Meyer, who is helping with dispatching herself, says hazard research is very hands-on compared to traditional academia. All the research done has an immediate turnaround to help people in society.

“The original impetus of disaster social science is applied,” she said. “That's what drew me to our center, that it's part of our goal to have an impact. And it isn't just 10% or a fraction of what we do, it's a core piece. When we think of research, we immediately consider how it will be applied.”

### USING GIS AND THE TEXAS ATLAS

Texas A&M researchers also use their expertise to help communities' disaster planning.

Fellow Hazard Reduction & Recovery Center researchers Doug Wunneburger, associate professor of urban planning, and Jaimie Masterson, associate head of [Texas Target Communities](#), mapped several Texas counties' community organization and COVID-19 needs in the [Texas Coastal Communities Planning Atlas](#), an online, interactive map with flood, wind, and surge zones, evacuation routes, population location, and more that communities use for hazard planning.

“Jaimie informed us of a community need to locate pockets of quarantined elderly people who might be struggling to get food because they don't live close to a grocery store,” Meyer said. “Using our

mapping resources, Wunneburger and Masterson added data to the Coastal Atlas, pinpointing some neighborhoods in counties north of Dallas where there may be more elderly who are in need of services, so organizations can dispatch help to those specific areas.”

Wunneburger, a GIS expert who has contributed his knowledge to Texas A&M for over 30 years, mapped elderly and other vulnerable populations that frequently use food banks, and identified low and moderate income areas, which Meyer says is vital for identifying immediate needs as well as informing policy and getting grants from the federal government to support community needs.

### PREVENTING FUTURE DISASTERS BY EMPOWERING LOW INCOME POPULATIONS

“One of our efforts is helping with hazard mitigation planning, which is hazard planning that happens before a disaster to prevent negative impacts, like improving ditches to decrease flooding,” said Meyer. “Communities can get funding for this, but they have to show they are using the money for those in need.”

Meyer said a ditch system will affect a lot of neighborhoods, but by mapping out the percentage of low to moderate income population in the benefit area of the project, they can more easily

find funding.

“Scholars have found that lower-income individuals are the most impacted and have the worst time recovering from disasters,” she said. “Affordable housing is in more hazardous areas. Minorities were historically segregated into more hazardous areas and communities have not invested in risk reduction in those neighborhoods as they have in wealthy, whiter neighborhoods. If we target limited funding to promote equity for vulnerable populations, it makes the whole community more resilient.”

### LONG TERM, POST-DISASTER HOUSING SOLUTIONS

Meyer has also begun a first-of-its-kind study of the effectiveness of private aid groups' in long-term, post-disaster housing recovery.

Natural disasters are increasing in size and frequency, and disaster-related housing recovery costs are on the rise, said Meyer. Because government assistance and private insurance often are inadequate to ensure full recovery for all affected people, private philanthropic resources, if used effectively and efficiently, may also help disaster survivors.

However, philanthropic response to disaster is understudied, said Meyer. “Little is known about what makes these organizations' operations

more or less effective in promoting community recovery and resilience. This will be the first investigation of its kind.”

Meyer's project will include the development and analysis of a new dataset of nonprofit disaster housing recovery operations using data from recent disasters.

After her research is finished, Meyer will test a training program for local nonprofit organizations and foundations aimed at improving their disaster recovery operations.

The program will be developed as part of the study with the [Center for Nonprofits and Philanthropy](#) at Texas A&M's Bush School of Government and Public Service and the [OneStar Foundation](#).

Meyer's research team includes postdoc Carlee Purdum, graduate students Joy Semien, Mason Alexander, and Kyle Breen (LSU), undergraduate research assistants Romel Fernandez, Jackson Pierce, Arthur Chambers, Nathan Young, Haley Yelle, and Abigail Bowers (LSU), and researchers Brant Mitchell and Stuart Nolan from the Stephenson Disaster Management Institute at LSU.

By Sarah Wilson

Construction science assistant professor Manish Dixit is learning how humans can best be trained to work on the moon, Mars or extreme environments on Earth.

# One Small (Virtual Reality) Step for Man, One Giant Leap for Mankind

## TRAINING FOR MARS IN TEXAS

If humans are ever to build, live and eventually thrive on the moon or Mars — momentum for this idea is growing at NASA and any number of private organizations — they must learn to stretch the boundaries of their mental and physical abilities.

How can people be prepared to work in microgravity, low or no atmosphere, without a traditional sense of direction or orientation — or in extreme environments on Earth — and how can we do it safely?

Manish Dixit '09, a Texas A&M assistant professor of construction science, is leading a team of researchers developing virtual reality-based simulations to train people to work and live in these environments in a three-year, \$1.2 million National Science Foundation-funded study.

## LEARNING NEW SPATIAL SKILLS AND ENVIRONMENTAL RULES

Learning to adapt in an extraterrestrial location or in a place where common environmental reference points are absent can be a life or death matter, Dixit said.

“If you’re in a city, you can look down

the street and kind of know how far a building is away from you,” he said. “If a car is coming at you, you can judge the approximate speed of it because the trees, cars, buildings, and your knowledge of the existing environment helps you with your perception.

“But imagine on the moon or Mars, there is nothing to compare something to. How do you judge distance, size or speed if something is coming at you?”

Dixit and his team are also creating simulations and training for other extreme environments.

“Deserts have similar challenges,” he said. “There are only sand dunes for miles and miles. How do you perceive distance and size there?”

### **A LESS DANGEROUS WAY TO TRAIN FOR ALTERNATE ENVIRONMENTS**

There’s a desperate need for alternative training procedures because existing methods are expensive, strenuous and dangerous, he said.

“To train workers for microgravity conditions like space, parabolic flights are used to experience a microgravity-like environment through free fall,” he said. “This is expensive and risky. Each flight has to perform multiple parabolic climbs and descents to achieve a few seconds of microgravity.”

For now, as the number of people training to go to space is few, Dixit said it’s a somewhat reasonable method, but what about when space is colonized? How will all those people be trained?

Traditional scuba diving training methods

are also risky, he said. “In 2014, nearly 1,220 emergency room visits due to scuba injuries were reported in the U.S. alone, resulting in 188 deaths.”

### **TRAINING FOR MARS AND MORE IN VIRTUAL REALITY**

Dixit, Ann McNamara and André Thomas, both visualization faculty members, along with Joseph Orr and Jyotsna Vaid, faculty members of the Texas A&M Department of Psychological Brain Sciences, and Greg Chamitoff, a former astronaut and professor of aerospace engineering, have created VR simulations for a variety of alternate conditions that could mentally prepare trainees.

There are simulations for the International Space Station, underwater, microgravity (free-floating and altered), Martian, lunar, polar (north and south) and desert situations, as well as a city environment as a control scenario.

In the simulations, subjects are asked to perform

spatial tasks using virtual objects that test their spatial skills.

Subjects’ eye movements, brain electrical activity, cognitive strategies and mental workload during behavioral tests are monitored in simulated, normal, and altered environments. The team then applies the results to create a framework for virtual training or video games to help people compensate and learn the abilities to keep them safe and productive in alternative environments.

### **HELPING DISASTER VICTIMS AND RESPONDERS**

The research team’s findings and simulations are also relevant on Earth.

“Altered conditions exist here too,” Dixit said. “In wildfires, when first responders are helping, they can lose their sense of direction, orientation, and spatial ability. When Hurricane Harvey came, people had issues navigating when they couldn’t see the road.”

He’s also planning high school visits to let students try out the virtual simulations and start discussions about how all the science and rules they know could change in alternate environments where they may work or live someday.

### **OPEN SOURCE SOLUTIONS**

Dixit’s results and VR simulations will be released as open source upon the study’s completion so anyone can develop and use it.

The study was paused during the COVID-19 crisis, but a pilot study that will adhere to social distancing guidelines is set for the fall.

Its funding is from the Future of Work at the Human Technology Frontier Program of the National Science Foundation’s Division of Computer and Network Systems.

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By Sarah Wilson



# Chairs & Professorships

Chairs and professorships within the College of Architecture serve as distinctions of the highest honor for professors with outstanding records of teaching, service and research. Created to honor both the holder and the donor, these awards recognize exceptionally driven, passionate, and inventive members of the university faculty. Those awarded have accomplished remarkable achievements within their discipline, expanding knowledge and pursuing solutions on both a national and international scale.

The funding provided by these endowments encourages strong leadership, interdisciplinary research, innovative teaching methods, and discovery activities related to the natural, built, and virtual environment. Additionally, the awards serve to recognize the value of these professors' contributions to their students, disciplines and communities.

We seek to honor and recognize the holders of these chairs and professorships whose excellence in research, creative works and scholarship help set us apart as one of the most innovative programs in the country.



**DR. RYAN AHN**  
History Maker Homes Endowed  
Professorship in Construction Science



**DR. KC CHOI**  
Cecil O. Windsor, Jr. '66 Professorship in  
Construction Science



**DR. AMIR BEHZADNAN**  
Clark Construction Group, Inc.  
Endowed Professorship in Construction  
Science



**DR. CHARLES CULP**  
Liz and Nelson Mitchell Professorship in  
Residential Design



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**DR. PATRICK SUERMANN**

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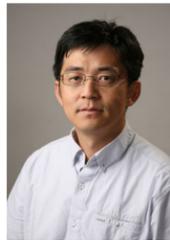
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Educational Architecture Professor

## Supporting Research and Creative Works

The College of Architecture is committed to providing the highest quality education for our students. Crucial to providing an exceptional learning experience is the recruitment, retention, and development of outstanding faculty. We as a college are committed to providing resources and recognition to well-deserving professors who are preparing our students for important careers in architecture, construction science, landscape architecture, land development, urban planning and visualization. Fellowships, professorships and chairs are among the highest academic awards bestowed on faculty. Beyond the recognition, these endowments generate funds to support outstanding faculty in their teaching, research and outreach efforts. The recognition and resources provided by these awards help us to attract and retain thought leaders in our disciplines.

Please consider supporting our faculty through establishing an endowed faculty fellowship, professorship or chair in the College of Architecture. Endowments can be funded over a period of up to five years, and you have an option to give an additional amount so the award can be made during the years preceding the endowment's full funding. You may designate a preference for your gift to support faculty in a specific department, or it can be awarded without a designated preference. Endowments may be named for yourself or for someone you wish to honor.

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- Fellowship - permanent endowed gift of \$150,000
- Professorship - permanent endowed gift of \$150,000
- Chair - permanent endowed gift of \$1 million

For information on how you can establish an endowment to support faculty in the College of Architecture, or to learn about giving opportunities benefiting students or programs, please contact:

**Larry Zuber**  
Assistant Vice President for Development  
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