

Innovations

IN RESEARCH & CREATIVE WORKS



TEXAS A&M UNIVERSITY
College of
Architecture

FALL 2021

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Front cover: Texas A&M College of Architecture researchers seek solutions for critical issues faced by our society. These solutions include innovative “green-” or “tech-,” based responses to worsening natural hazard impacts on the built and natural environment, proposals for a more equitable transportation system, a safer, cleaner natural environment for everyone, and many more.

The college is also a creative hub where faculty reimagine the status quo with artistic innovations in traditional and electronic media.

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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, construction science, land and property development, landscape architecture, urban planning, 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.



TEXAS A&M UNIVERSITY
College of
Architecture

From the Dean

Innovation in research and creative works holds the key to addressing the challenges and overcoming the obstacles to living our best lives, in places that enhance our well-being and support our achievements.

Our faculty make a difference in the lives of students, communities, and the nation through groundbreaking work in architecture, construction science, landscape architecture, urban planning, and visualization. They are dedicated to applying their knowledge to solving real-world problems and to educating the best-prepared graduates who are poised to make an impact on their disciplines and the world.

Our faculty model interdisciplinary collaboration, facilitate experiential learning opportunities and mentor undergraduate and graduate students to prepare the next generation of practice and academic leaders.

Integral to achieving this lofty goal is creating 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, service and teaching to tackle important issues such as social justice, sustainability, education, health and safety, and hazard reduction and recovery.

In this 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 Shannon Van Zandt's research in affordable housing, neighborhood natural disaster-related vulnerability and resiliency, and her commitment to mentoring students who will change the world as future practitioners and academics, Susannah Bieber's timely research on the purpose and impact of public art on society, and much more.

We begin the fall 2021 semester with appreciation for the resiliency of our faculty, students, and staff and with a renewed commitment 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 follow us on social media and 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

Contents

08 STATEMENT
FROM COLLEGE
EXECUTIVE
LEADERSHIP TEAM

10 RESEARCH
EXPENDITURES &
FUNDING

12 WHY PUBLIC ART
MATTERS

By Richard Nira

16 HEAVY METAL

By Sarah Wilson and Aubrey Vogel

20 A NEW URBAN ENERGY

By Sarah Wilson and Aubrey Vogel

24 SHOCKED FOR SAFETY

By Sarah Wilson

28 THE ARTIST OF
EVERYTHING

By Sarah Wilson

32 NO PLACE LIKE
HOME

By Diane Oswald

36 A TWO-WHEELED
SOLUTION

By Richard Nira

40 TAKING SHAPE

By Richard Nira

44 JOBSITES VERSUS
HURRICANES

By Richard Nira

48 SAVING THE
WORLD WITH
WASTE

By Sarah Wilson

52 CHAIRS &
PROFESSORSHIPS

55 SUPPORTING
RESEARCH AND
CREATIVE WORKS



TEXAS A&M UNIVERSITY
College of
Architecture

As part of a Tier One research university, our college is committed to excellence in research, teaching and outreach in a welcoming, inclusive environment where diversity thrives.

Our faculty, students, former students and staff strive to make a difference in their disciplines and communities through innovation and exceptional work.



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Programs & Facilities

Research Expenditures & Funding

2020–2021

\$5M IN RESEARCH SPENDING

33% INCREASE IN RESEARCH FUNDING FROM 2019–2020

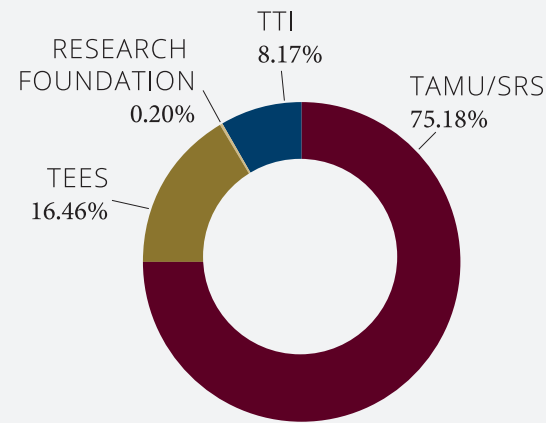
RESEARCH IMPACT

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

BY DEPARTMENT

DEPARTMENT	SPENDING	FUNDING	TENURE/TENURE TRACK FACULTY	EXPENDITURE PER TENURE/TENURE TRACK FACULTY	PROJECT THEMES
<i>Architecture</i>	\$878K	\$726K	30	\$29K	<ul style="list-style-type: none"> Air dehumidification Infrared thermography Energy management
<i>Construction Science</i>	\$1.1M	\$2.3M	15	\$76K	<ul style="list-style-type: none"> Wearable technology Artificial intelligence Energy life cycles
<i>Landscape Architecture & Urban Planning</i>	\$1.7M	\$1.5M	21	\$80K	<ul style="list-style-type: none"> Urban green infrastructure Texas Freedom Colonies Urban planning effects
<i>Visualization</i>	\$474K	\$2.8M	15	\$32K	<ul style="list-style-type: none"> Game development VR workspaces
<i>Colonias Program</i>	\$806K	\$396K	N/A	N/A	<ul style="list-style-type: none"> Community education Promoting HPV vaccinations Training health workers
Total	\$5M	\$7.7M	81		

SPENDING BY SOURCE



AGENCY	EXPENSE
<i>Texas A&M University / Sponsored Research Services</i>	\$3.7M
<i>Texas A&M Engineering Experiment Station (TEES)</i>	\$819K
<i>Research Foundation</i>	\$10K
<i>Texas A&M Transportation Institute (TTI)</i>	\$406K
Total	\$5M

30 FACULTY INVESTIGATORS RECEIVED GRANTS

\$7.7M IN EXTERNAL RESEARCH FUNDING

33 EXTERNAL FUNDING SOURCES

Why Public Art Matters

RESEARCHING PUBLIC ART'S RISE TO RELEVANCE AND WOMEN ARTISTS' STRUGGLE FOR EQUALITY

Public art, and its detractors, go hand in hand. An online search quickly reveals results like:

“Why Public Art is So Consistently Awful,” “What is the Point of Public Art if the Public Does Not Like It,” and others.

These aren't new complaints, said Susannah Bieber, an award-winning art and architectural historian in the Texas A&M departments of visualization and architecture whose research focuses on American artists of the 1960s.

That era's artists were well aware that many view art as frivolous and elitist.

ART FOR CHANGE

Bieber, who is writing a book about '60s art, said many of the era's artists engaged with the built environment because they wanted to make their art more relevant to the general public.

Their effort worked.

Although plenty of public art naysayers remain, as reflected in those search results, '60s artists were indeed able to significantly elevate public art's relevance to the general public. They did something important — their art helped change how American society looks at “big picture” matters such as the Vietnam War. They showed that art can inspire a society to question the status quo and to critically reevaluate historical events from different perspectives.

Bieber's research also reveals female artists' previously

unsung contributions as well as their struggles with art world sexism.

A NEW WAY TO LOOK AT SCULPTURE


In the '60s, artists such as Claes Oldenburg began to reimagine the monument, a staple of public art for centuries. Monuments traditionally celebrate war victories or heroism in a vertical orientation — a man on a horse on a pedestal is a typical case.

Oldenburg had different ideas about monuments. He reimaged well-known structures such as the Washington Monument, for example, in a drawing of a giant pair of scissors pointed skyward. “Designs like these, which he never intended to be built, have a light-hearted touch but seriously rethink what a monument could be,” said Bieber. “He's questioning society's framework of what a monument is honoring, for whom and for what purposes it was built.”

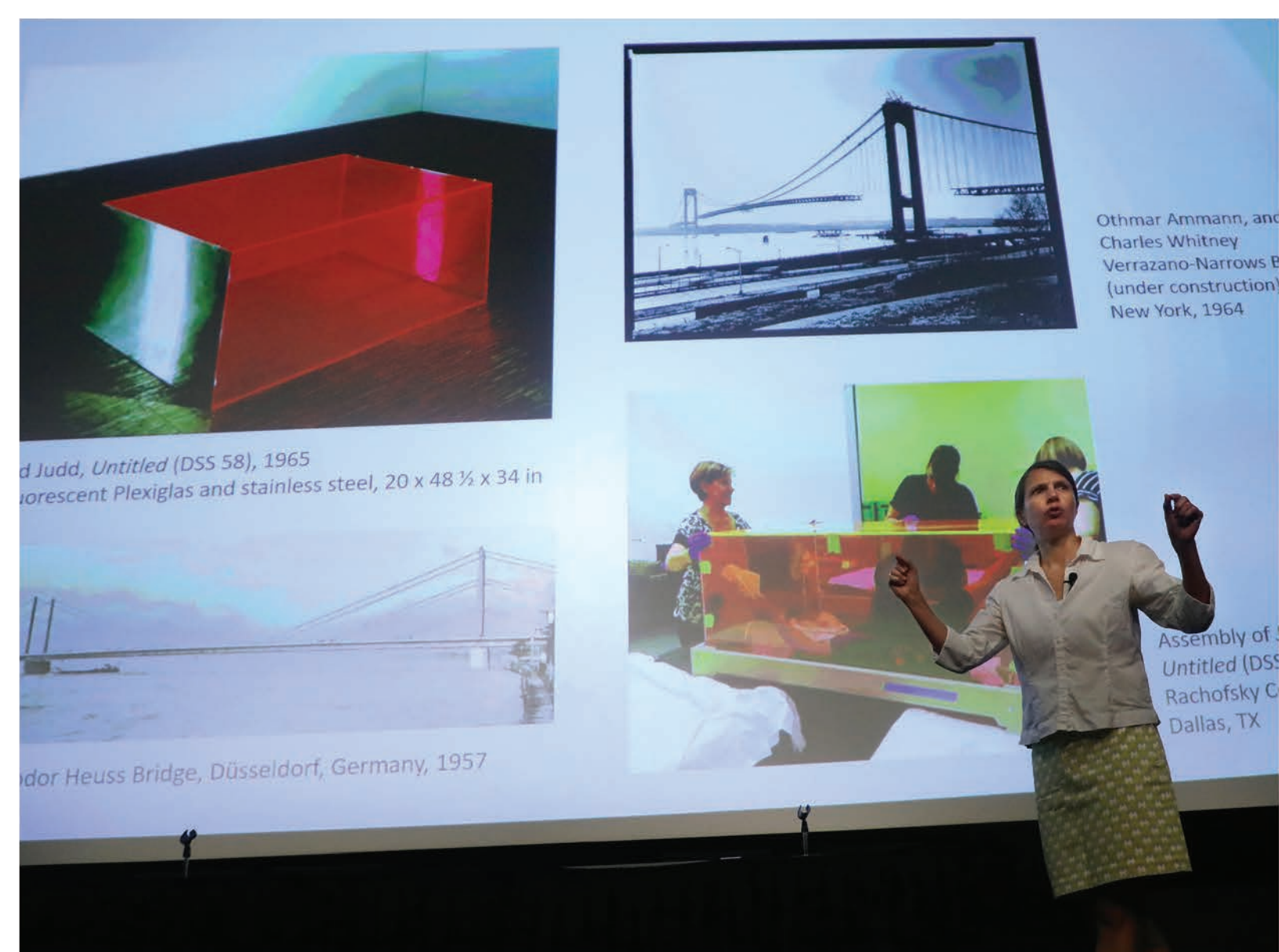
ART AS PROTEST

In 1969, as the U.S. war in Vietnam and antiwar protests in the U.S. raged, Oldenburg, supported by a group of Yale University faculty and students, built a monument that served as a protest against the war and as the centerpiece of a campus protest area.

The piece, “Lipstick (Ascending) on Caterpillar Tracks,” was a tank made of painted plywood with an inflatable, lipstick “bullet” pointing skyward from its center. Placed overlooking the campus' World War I memorial and the



Art is something that plays into our daily lives and can help us envision a better future.



Bieber, who studies the relationship between art, architecture and the built environment, makes a presentation during the 2018 research symposium hosted by the College of Architecture.

president's office, the piece resists a simple interpretation, but like his Washington Monument/scissors drawing, it's Oldenburg's way of asking what values a monument reflects and how it perpetuates these values, said Bieber.

Another artist who rose to prominence in the '60s, Robert Smithson, also questioned monuments' form and purpose.

Before his untimely death in a 1973 airplane crash, Smithson created sculptures for display in landscapes instead of indoors, sometimes using reflected materials and glass sheets — a departure from the white/gray surfaces of traditional monuments.

"Smithson's pieces acknowledge different kinds of histories, not just the history of victory as told by white men, but histories that acknowledge pain, suppression, or environmental degradation," said Bieber. "He influenced later artists, who further developed his artistic concepts."

Then, in the '80s, the efforts of '60s artists led to something that changed society.

ART TO REMEMBER

In early 1981, Maya Lin, a 21-year-old architecture student at Yale, submitted what would become the winning entry in a national design competition for a Vietnam Veterans Memorial for

the National Mall in Washington D.C.

Her design echoes the tradition-breaking work of Oldenburg, Smithson and their 60s contemporaries with its reflective, polished black granite instead of monuments' traditional white limestone or marble, and its horizontal, not vertical, orientation.

"The monument, instead of making a heroic statement, honors those who died, acknowledges the cost of war, asks us to consider the arguments for war and the arguments against it," said Bieber. "It's not a 'black and white' statement."

"I would argue that her proposal wouldn't have been possible without the previous work of Oldenburg, Smithson and their contemporaries," said Bieber.

Lin's design, said Bieber, builds on the work of '60s artists who made art so that the public became aware of different, complex narratives that are sometimes difficult to frame in words and arguments.

The design also showed how public art could help heal a nation. The Vietnam Memorial helped Americans come to terms with the war, helped the country acknowledge soldiers' sacrifices, and became a source of healing for Vietnam veterans: in other words, the memorial is public art that is powerful and relevant to the everyday lives of Americans.

WOMEN ARTISTS STRUGGLE FOR EQUALITY

In her research of female artists of the '60s, Bieber is discovering their important contributions to the decade's art that is often unacknowledged, and the gender-based hurdles they faced.

The decade saw the debut of soft sculpture, a new kind of art made of rubber, latex or other nontraditional materials. Oldenburg and other male artists are considered soft sculpture pioneers, but Bieber's research has revealed that in Oldenburg's case, a female artist named Patty Mucha, Oldenburg's wife at the time, was a key figure in its development.

Mucha's contributions to the invention of soft sculpture led to the demand for Oldenburg's first exhibition at New York's Green

Gallery in 1962, which kicked off Oldenburg's trajectory into a major American artist.

"Oldenburg became very well known for his soft sculptures," said Bieber, "but Mucha was a collaborator, the artist sewing these sculptures. She was doing the work, she was using her sewing machine and using the scissors and the needles with dexterity and skill to create new, innovative forms."

Mucha was also a key collaborator in Oldenburg's "Happenings," a series of performance art events that they and other artists staged. Their work was part of New York's emerging pop art scene.

Bieber is also researching another artist, Judy Chicago, a pioneering feminist artist who became known throughout the world for "The Dinner Party," an iconic installation that commemorates important women throughout history.

But Chicago was met with high walls of sexism early in her career, especially when wanting to work with new, innovative techniques. She and other women artists lacked the support from the art world and industries that was provided to male artists, said Bieber.

A number of female artists proposed projects for a 1971 art and technology project hosted by the Los Angeles County Museum of Art, said Bieber.

"The museum's curator didn't seriously consider their proposals, because science and technology were seen as a male domain. The project ended up exhibiting the work of about 60 artists, all of them men," said

Bieber. "Chicago was interested in using technology, new materials, new inventions, but she was continuously sidelined because of her gender."


"It's important to realize that art history unfolded with this level of discrimination," said Bieber. "Artists were also often excluded on the basis of their race and sexual orientation."

As the work of '60s artists continues to echo today, Bieber will continue to scour art history archives to shed light on art pioneers whose work helped change American society.

"I'm very interested in people seeing that art shapes our lives, that it has the power not just to reflect but question and reframe our values," she said. "Art is something that plays into our daily lives and can help us envision a better future."

Bieber's research has received support from the Smithsonian American Art Museum and the Crystal Bridges Museum of American Art. Her essays of '60s artists were honored with awards from The Terra Foundation for American Art and the Journal of Architectural Education.

By Richard Nira



The importance of educating the youth is because they are at such a prime state in their development

Heavy Metal

RESEARCHERS WORK WITH STUDENTS TODAY FOR A HEALTHIER TOMORROW

IT'S IN THE AIR. METAL, THAT IS.

Specifically, in the toxic air that surrounds Furr High School, just 4 miles from the Houston Ship Channel's oil refineries and plastics facilities.

Deidra D. Davis, a Texas A&M urban planning professor, is part of a team of researchers that aim in part to teach Furr students how to advocate for a healthy environment at their school and homes.

INVISIBLE POLLUTANTS

Houston, one of the 10 largest port cities in the U. S., is a main conduit for ships that facilitate worldwide trade. These ships burn bunker fuel, a thick, sulfur byproduct of traditional fuel/oil refining, and are large contributors to air pollution. Plastic and gasoline manufacturing facilities, also based in Houston, produce a level of air pollution that many experts consider unacceptable.

The hazardous and sometimes carcinogenic pollutants cause air quality issues, and a greater risk of developing health problems for those who inhale it, especially those located close to the facilities,

who are often lower-income residents and members of vulnerable populations.

"People are walking around and can't see the pollution, but it gets into their lungs," said Davis. "There are extremely fine particles that are inhaled."

While Houston's industries have regulations set by the Environmental Protection Agency which they are legally obligated to follow, Davis said the air quality issues are well known, but that it's hard to track and hold individual facilities responsible for their airborne emissions and the health effects they may cause in the surrounding communities.

MULTI-OBJECTIVE MISSION

Funded by a \$50,000 Texas A&M Center for Environmental Health Research Grant, Davis and her university colleagues, Project Investigator Shankararaman Chellam, a professor of civil and environmental engineering, and two co-PI's from the School of Public Health: Natalie Johnson, vice chair of the toxicology program, and Itza Mendoza-Sanchez, assistant professor, aim to better

understand air toxic metal levels and their health links in populations neighboring the ship channel.

Team members will monitor trace level metal measurements and use experimental models for determining aerosol toxicology. With this additional data, the team aims to expand the continuum of exposure research, hazard identification, risk characterization, and community action.

STARTING WITH YOUNG MINDS

The next generation's impact and influence begins long before they take over the workforce, said Davis. Students who become engaged with local issues that affect them could inform their long-term career decisions, potentially creating the next group of scholars, decision makers and world changers.

“The importance of educating the youth is because they are at such a prime state in their development,” she said.

“What these students become passionate about in high school could have an impact on what they choose to study in school and what they do with their lives.”

The Furr High School project started in May 2021 and consists of over 1,000 students from the 9th–12th grade.

“First, we’re gauging knowledge and awareness of these issues through surveying students, faculty and staff,” said Davis. “We want to know how they perceive the risks, how their growing knowledge influences their households and futures, and if they discuss these issues at home. We’re also looking to see if our study affects generational education and understanding.”

With her background in community-led health hazard resolution, Davis knows that community members will advocate for change when something is important to them.

Next, the researchers will familiarize students with the environmental issues affecting their area. Furr’s students

will then have an opportunity to engage with the project’s scientific processes, including work documenting results from an air quality monitoring system installed at their school.

“These students should be a part of this and have some agency in what occurs in their surroundings and how it can affect them in the future,” Davis said.

FUTURE LEADERS

Finally, the team plans to follow up with the students five to 10 years after they graduate to see if and how the program affected their everyday knowledge and ultimately their career decisions.

“We’d love to see who is taking up the torch and continuing to lead,” Davis said.


The team also aims to use their research to help community leaders establish a new policy that will help

protect residents and hold the industry to acceptable standards. They hope to use this as a pilot project and eventually expand the program.

The partnership is one of several Texas A&M/Furr collaborations over the years that included training Furr’s students to collect environmental data, and how to use geographic information systems software to record where their measurements were made.

The students’ measurements were part of a National Science Foundation-funded Texas A&M study to explore the notion of citizen-collected environmental data to aid municipal staffs charged with maintaining urban infrastructure.

By Sarah Wilson and Aubrey Vogel



Priya Jain is working to document the changing cultural and historic landscapes of Houston to recognize immigrant influence.

A New Urban Energy

DOCUMENTING SOUTH ASIANS' IMPACT ON HOUSTON'S CITYSCAPES

Immigrants who hail from South Asia, the Middle East and South America have created new communities in Houston while transforming abandoned structures in the city into vibrant hubs for commerce and community gatherings.

The city's rapid growth has been fueled in part by these and other immigrant groups who are making their own unique mark on the city's culture, history and architecture. However, their contributions aren't widely known outside their communities.

"This kind of urban revitalization often flies under the radar," said Priya Jain, Texas A&M assistant professor of architecture, who is tracing the architectural impact of urban, immigrant culture. "It doesn't get talked about in glossy magazines, but it plays a big role in keeping a city active. Previously vacant, defunct or abandoned properties get rehabilitated with a new life. Suddenly those areas are buzzing with activity."

Jain is tracing the architectural impact of immigrant culture and also learning what buildings, built or repurposed, are significant to individual cultures.

"As an immigrant myself, I wonder how we tell the stories of these people and the impact they've made," said Jain, a first-generation immigrant from India who came to the U.S. 16 years ago.

Jain, also the associate director of Texas A&M's Center for Heritage Conservation, along with researchers Sarah McNamara and Kazuko Suzuki of the College of Liberal Arts, is studying immigrants' impact in Houston with a \$32,000 T3 Texas A&M Triads for Transformation Research Grant.

HIDDEN INFLUENCES

Houston is well-known for its suburban sprawl and "strip mall vernacular," where buildings' functionality is often more important than its aesthetics. This type of growth and building style means it's that much harder to trace individual groups' influences and preserve buildings that are important to immigrants' cultural histories, said Jain.

"While Houston has its 'Chinatown' and 'Little India,' they look very different from their more historicized versions in other major cities," she said.

Jain is gathering data from a fast-growing subgroup, the South Asian community, many of whom have made their homes in what was originally known as the Hillcroft area on Houston's southwest side.

This "remade" place was originally a white suburb in the 1950s and '60s, said Jain. In the '70s and '80s, after those residents moved to newer suburbs, immigrants moved in and started to make their own mark.

"They took over these older buildings, sometimes repurposing them, but also built new buildings and created their own spaces, merging the old and new, trying to blend in and keep their cultural identity intact," said Jain.

One significant example is the district's Pakistan Cultural Center.

Previously a grocery store, it was converted into a community space with conference rooms, a library, prayer halls and sports and recreation rooms. It's now an important location for Pakistanis to come together and share their heritage, said Jain.

SIGNS OF CHANGE

In 2010, the city of Houston, in recognition of South Asian-Americans' impact, designated an area along Hillcroft Avenue, a major thoroughfare in Houston with a large concentration of South Asian ethnic stores and restaurants as the Mahatma Gandhi District.

Some community members also petitioned to rename that part of Hillcroft Avenue, to Mahatma Gandhi Avenue. "There was a lot of pushback and it never happened," Jain said. "But there was a slight compromise. 'Mahatma Gandhi District' signs were put up and it now kind of has both identities at the same time."

A KNOWLEDGE GAP

Documenting recent immigrants' impact on the built environment is a new and understudied research area, said

Jain. "While it's great that scholars are starting to catalog the stories of immigrants, architecture's role in that story is largely missing. We haven't talked about what kind of spaces these immigrants have built or what cultural value they ascribe to them."

To learn more about Houston's South Asian community, Jain and her team will interview these immigrants, who largely moved to Houston after the 1965 Immigration Reform Act and catalog their place-based experiences.

"We're going to ask them where they lived when they first moved here, where they worked, and in what neighborhoods," Jain said. "Where did they buy their first homes here and where did they find financing ... how did they develop their spaces and were they trying to blend in or stand out?"

Jain said they will also survey participants about their knowledge of historic preservation and what they feel should be a candidate for preservation in their community.

"The intent is to map what forms immigrant identity takes in a city like Houston and how that fits into our architectural history," Jain said.

The work could also help residents take ownership of their role of preservation processes and empower communities to preserve their heritage.

LOST TO HISTORY

Because Houston's immigrants have only been present for a few decades, their impact on the city and its architecture hasn't been recognized by most historic or cultural preservation efforts or organizations.

Traditionally, Jain says, in the U.S. buildings are not considered eligible for the National Register of Historic Places or similar lists that recognize historical importance until they are at least 50 years old, which could prevent more recent culturally important places from being protected.

"A lot of people assume that the rule is 50 years because that is the point at which buildings start to deteriorate," Jain said. "But that's not true. Buildings start to deteriorate within 10–20 years. So even with 50 years, we are going to lose a lot of buildings before we even have a chance to understand the social and cultural significance of these places."

Jain said this is a known problem in the global historic preservation community that some countries are trying to address. There are places, like the Houston Space Center, that immediately get added to the National Register because its role in the country's history is well known.

However, many significant structures get demolished without intervention or the opportunity for people to fight for preservation.

Jain said the quick, 2017 demolition of the iconic Hall of Nations in New Delhi, India, enraged the design and preservation communities locally and throughout the world.

"But because that building was only 40 years old, the government demolished it in a week," Jain said. "They didn't have to go through any regulatory process. There was a big uproar."

PROTECTING HISTORY

Culturally important sites in Houston could still be relatively young today, but will soon be candidates for preservation, said Jain.

To help prevent losing such structures to history, Jain serves on The Society of Architectural Historians Heritage Conservation Committee, an international group that petitions for significant buildings around the world that are threatened. They issue advocacy and position statements and try to bring attention to endangered structures to support their preservation.

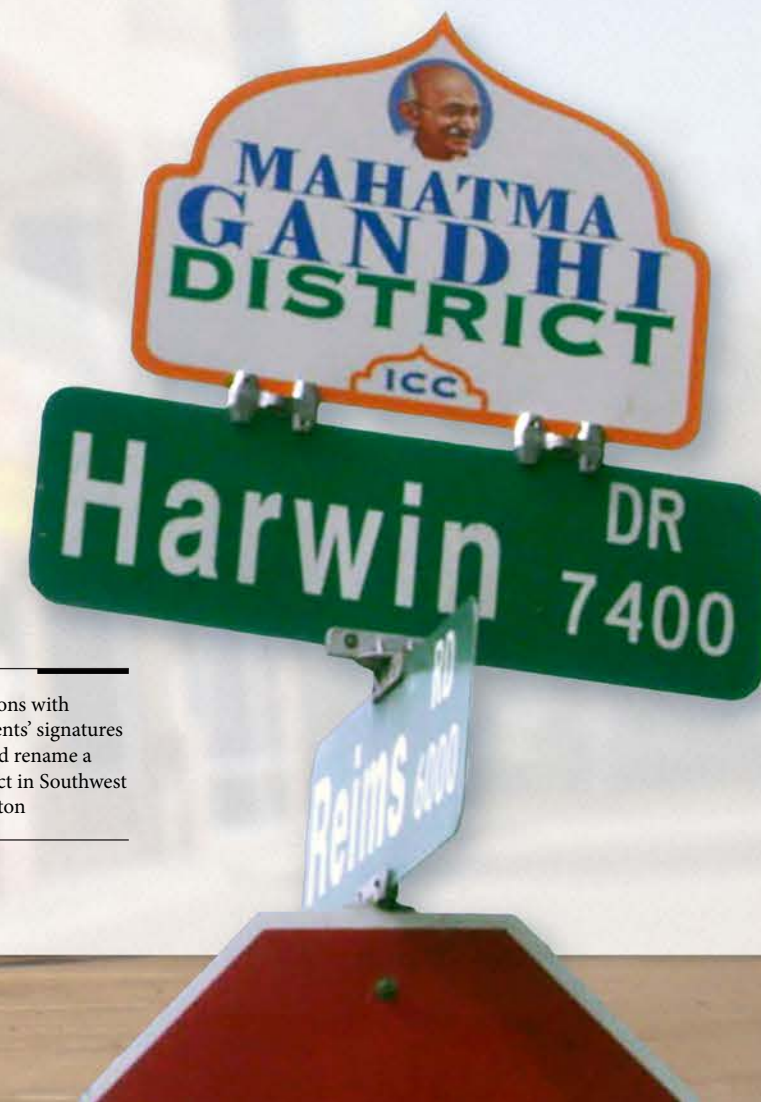
"These buildings truly are threatened and there is a real need for us to change our mindsets and policies to recognize that cultural and historical importance does not have to be tied to an arbitrary age value," she said. "We can transcend that and consider other overriding factors."

NEW STORIES

Researchers in Washington D.C. found that people who can trace their roots in communities over time could have better emotional well-being and a higher sense of belonging.

"The arguments for preservation are not only cultural but also social, psychological and environmental," said Jain. "A lot of preservation efforts begin at the local level. It really has to come from the people and begins with engaging the diverse communities that make up our cities and suburbs."

By Sarah Wilson and Aubrey Vogel



Petitions with residents' signatures helped rename a district in Southwest Houston

Shocked for Safety

INNOVATIVE VIRTUAL REALITY TRAINING COULD PREVENT REAL LIFE INJURIES IN CONSTRUCTION INDUSTRY

What if you could learn from your mistakes before they happen?

In high-risk industries like construction and electrical work, a single error can be life-altering or deadly. Workers take safety trainings, but long days and weeks of hard work around dangerous equipment can numb professionals to hazards — a well-known jobsite phenomenon that researchers call “risk habituation.”

To help prevent jobsite accidents and save lives by interrupting potentially dangerous, habituated jobsite behavior, Ryan Ahn, Texas A&M associate professor of construction science, is developing a research-based, virtual reality training environment that doesn't expose workers to real-life risk.

Funded by a \$750,000 National Science Foundation [grant](#), Ahn and Brian Anderson, Texas A&M associate professor of psychological and brain sciences, are creating virtual reality environments that simulate accidents, and provide unpleasant, but not dangerous, sensory feedback to trainees. They will then study how the training impacts trainees' risk perception and their attitudes about jobsite safety.

LEARNED RISK BEHAVIOR

Ahn has seen firsthand how accidents can affect workers and their families.

“My uncle was an employee at my dad's construction company and was badly injured doing electrical work,” Ahn said. “He was in the hospital for a long time.”

Ahn's father built the family home and headed an electrical contracting company during Ahn's youth, which inspired him to choose architecture as his college major.

However, he quickly learned that art and design wasn't his favorite work. Because he also had an interest in technology, he switched majors to construction science, and discovered his passion for using emerging tech to improve construction safety.

Electricians, like Ahn's uncle, have dangerous jobs. Because they work at heights and with high voltage, they encounter high risk every day.

Ahn said that while these workers are highly trained and skilled, they often fall prey to “risk habituation,” which causes many occupational workers to unintentionally expose themselves to hazards.

“There are a lot of high-risk hazards on a jobsite, and on the first day, these workers are informed of them in detail,” Ahn said. “But they work for a long time and find the hazards aren't having a direct impact on them, so they start to ignore them.”

Ahn said once workers do something against safety standards and nothing happens, it can feel like there isn't as much risk anymore and they're far more likely to repeat the behavior.

“You do it the wrong way so many times and nothing happens, so you think it's safe,” Ahn said. “That is when injury happens.”



BACKGROUND NOISE

Another contributing factor for workplace safety accidents is “sensory level habituation,” which happens when professionals who work close to safety equipment end up tuning out audible warning signals simply because they acclimate to the sounds.

“We’re investigating how much these workers are habituated to those sounds,” Ahn said. “By doing a psycho-physical assessment on workers with three or more years of experience in the field, we can see if the brain is responding to those sounds or if they’re just hearing them as background noise.”

BREAKING THE HABIT

Similar to how a child is more careful to not touch a stove after burning their hand, Ahn says a worker who has experienced an accident becomes more alert of the dangerous behavior.

Ahn hopes to create a similarly powerful and long-lasting memory without endangering a person’s body.

To do this, Ahn and his team created a virtual, simulated working environment. The first scenario is a pedestrian roadway worker doing a job around heavy machinery.

A subject who enters the training is given an assignment in the virtual jobsite and is monitored as they work via eye movement tracking technology. Most subjects start habituating, or stop paying attention to safety signals, after just 15–20 minutes into the simulation, he said. When the worker stops paying attention to safety signals or being aware of what’s around them, trainers expose them to consequences.

“We run them over with a streamroller,” Ahn said.

Subjects experience the visual sensation of the accident in virtual reality and punitive feedback via sound, vibration and electrical impulses from a backpack that stimulates their nerves.

The shock is harmless, but the combined experience creates a more vivid simulation and, hopefully, a more sustained memory impact, said Ahn.

CHANGING BEHAVIORS

The team did a version of the experiment where some subjects experienced an accident and others, who were more alert to signals, did not. A month later, they brought back both groups and found that those who didn’t experience the accident habituated much more quickly than their steamrolled counterparts.

“They got complacent,” Ahn said. “Later we will get feedback from their safety manager to see if their behavior has improved.”

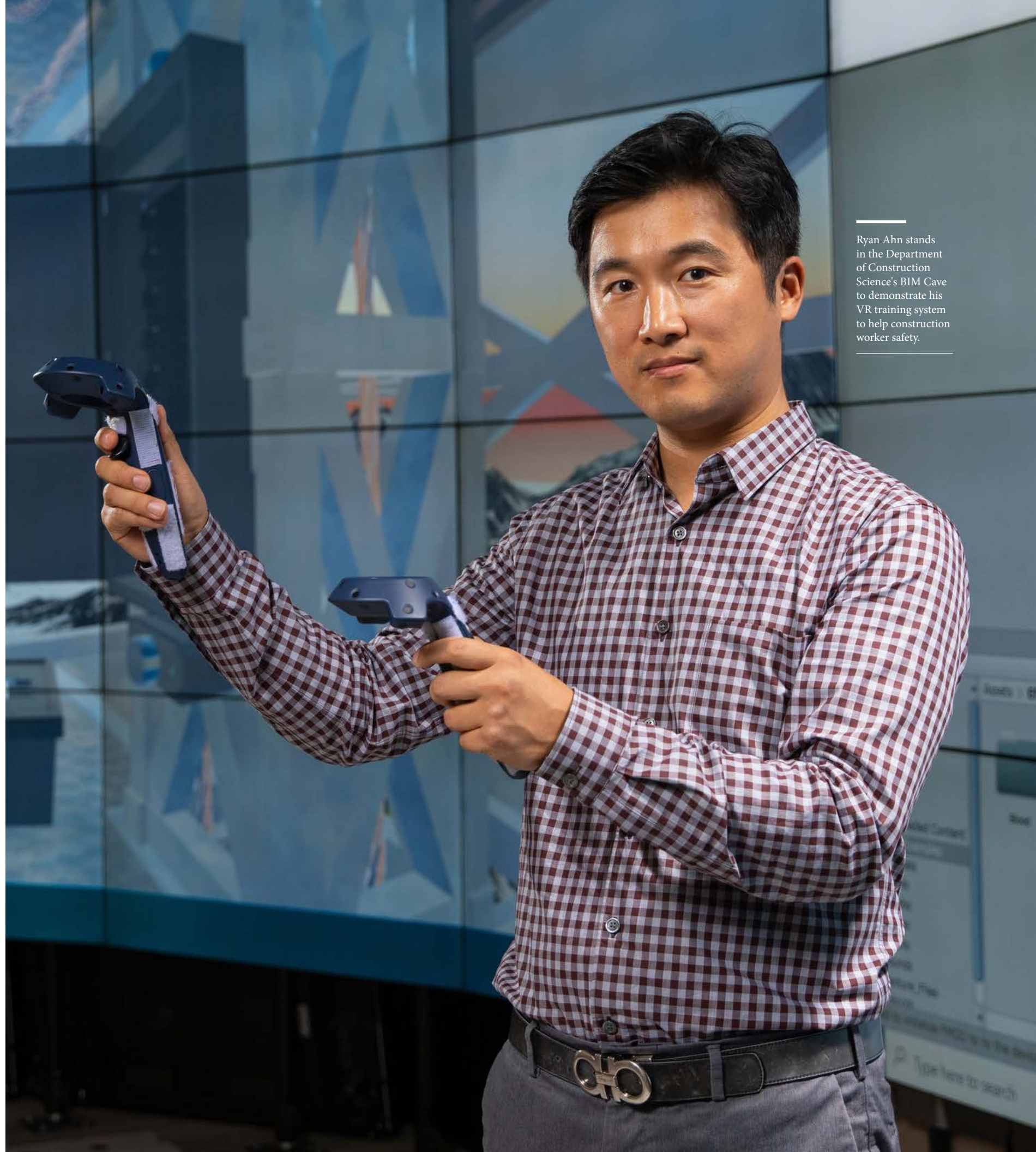
Ahn hopes his VR training system can eventually replace the existing safety programs workers go through, which are classroom-based lecture programs where certified instructors talk about common hazards of jobsites and how to avoid them.

“The workers are required to take those trainings repeatedly,” Ahn said. “The problem is that while it delivers the knowledge and refreshes it, it is not changing the behavior of the workers.”

By presenting their behaviors in VR and doing an intervention, Ahn said he believes that they can actually change behaviors and improve jobsite safety.

By Sarah Wilson

Ryan Ahn stands in the Department of Construction Science’s BIM Cave to demonstrate his VR training system to help construction worker safety.



THE ARTIST OF *Everything*

By Sarah Wilson

Inspiration is ever flowing for lifelong artist Russell Reid. After more than 50 years working as a professional artist, architect and educator, he relentlessly pursues greater and more elaborate creative and design challenges, following his muse wherever his imagination leads.

“My interests are a mile a minute,” he said. “My albatross has been staying focused long enough to complete a project or interest before moving on to the next thing.”

Reid, a globally celebrated artist who has mastered scores of artistic styles and mediums, believes that creativity and interests are cyclical outlets of expression. With that perspective, he rejects the idea of limiting himself to a specific niche.

His portfolio is vast, including building-size architectural murals and large scale art in the styles of Trompe L’Oeil, Grisaille and Fresco Secco; technical and architectural rendering and illustration; commercial art and advertising, book illustration, environmental graphic design, assemblage art concepts, stained glass design, fine art drawing and painting, journaling, and more over the decades.

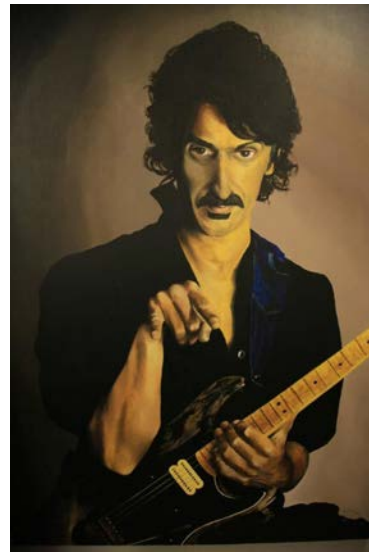
His current passion is digital painting, specifically hyper-realistic art that at first glance looks like a photograph. His present subject is vintage cars, painstakingly drawn pixel by pixel with a pen and iPad, accurate down to the reflection of the sky or trees in the chrome bumpers.

“I love the challenge,” Reid said. “I push myself to see how closely and accurately I



“My interests are a mile a minute...”





A large-scale (72"x48") musician portrait series done in 1986-87 in oil on wood panels. Far left: "B.B. King," middle left: "Bob Marley," middle right: "Jimi Hendrix," and far right: "Frank Zappa."

can push the technical aspect of the end result."

He's also recently completed a wall-sized 3D mandala painting/ installation in the College of Architecture, complete with lights and woodwork.

"I learned to do some electrical work in that process," he said. "It was a lot of fun. Every project one takes on should be a teaching and learning

opportunity. No one is ever too old to learn new things."

Reid's passionate artistic spirit has made his classes hugely popular among students, who regularly send him work for review and thoughts after graduation.

"That is the absolute greatest compliment," he said. "To see that they were inspired to continue their interests and work."

"1957 Dodge Custom Royal" is a 24"x36" print digitally drawn in Photoshop in 2018.



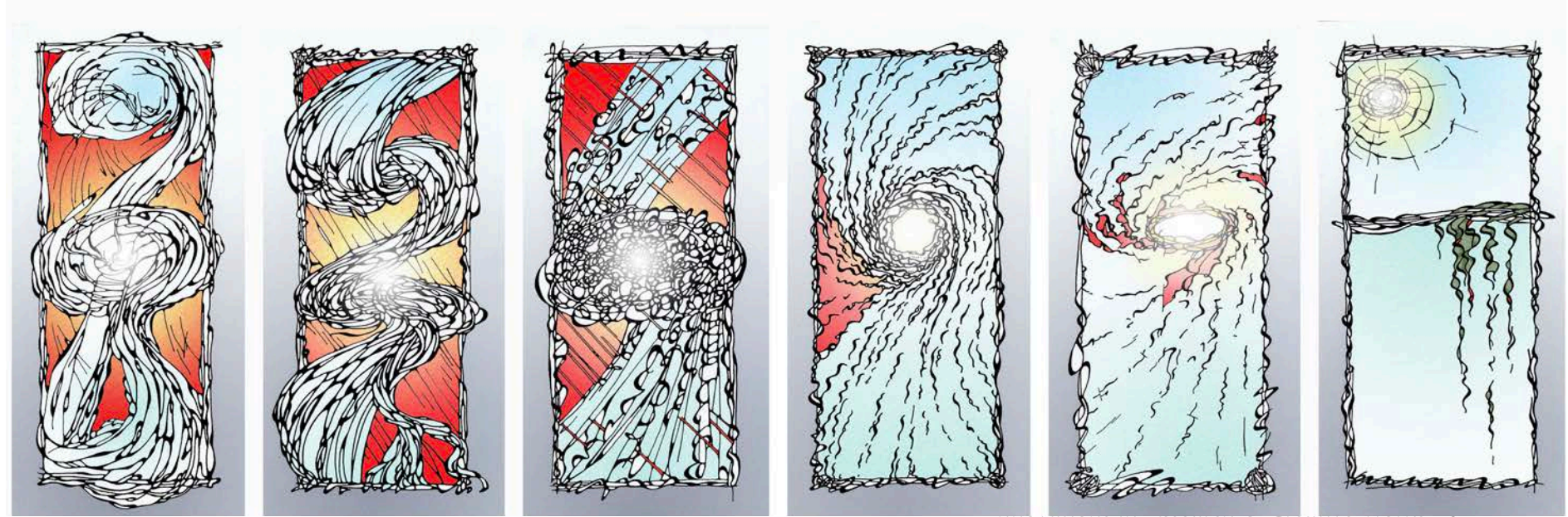
Reid '89 has a Bachelor of Environmental Design and a Master of Architecture degree, both from Texas A&M. As an artist with diverse experience and expertise, the associate professor holds joint appointments with the departments

of visualization and landscape architecture and urban planning, and is an adjunct faculty member for the architecture department. He is also a fellow in the Institute for Applied Creativity and holds a Certificate in Historic Preservation.

"The Milano Paintings, Day 1-6," is a series done in ink on paper and Photoshop in 1990.



"The Mystery of Art" was a solo exhibition housed in the College of Architecture's Wright Gallery in 2014.



No Place Like Home

MENTORING THE NEXT GENERATION OF URBAN PLANNERS

As an urban planner, Shannon Van Zandt, professor and executive associate dean at the Texas A&M College of Architecture, knows that where one lives has a major impact on an individual's well-being.

"My career began with an interest in affordable housing and low-income home ownership," said Van Zandt. "But now I also focus on the dramatic effect that the location of one's home can have on an individual or family's health, safety and prosperity."

As such, her focus includes identifying forces that restrict access to high-quality neighborhoods and the consequences of such restrictions, including poor access to community amenities and greater exposure to natural disasters like urban flooding.

A renowned researcher, Van Zandt has published on affordable housing, neighborhoods' natural disaster-related vulnerability and resiliency, housing recovery and more. Her projects have been funded by the National Science Foundation, the U.S.

Department of Housing and Urban Development, and the National Institute for Standards & Technology, to name a few.

In addition to supporting informed, housing-related policymaking and outreach efforts, her work shapes the next generation of urban planners through teaching and mentoring current and former students.

"I met Van Zandt at graduate student orientation," said Marccus Hendricks '13, an assistant professor of urban planning at the University of Maryland. "She was very intentional in making me feel welcome, showing a genuine interest in me as an individual and professional, and she has been my mentor ever since."

Van Zandt served as Hendricks' major professor and dissertation committee chair while he was at Texas A&M, and they now work as co-investigators on research projects, co-authors on publications and co-panelists at professional meetings.

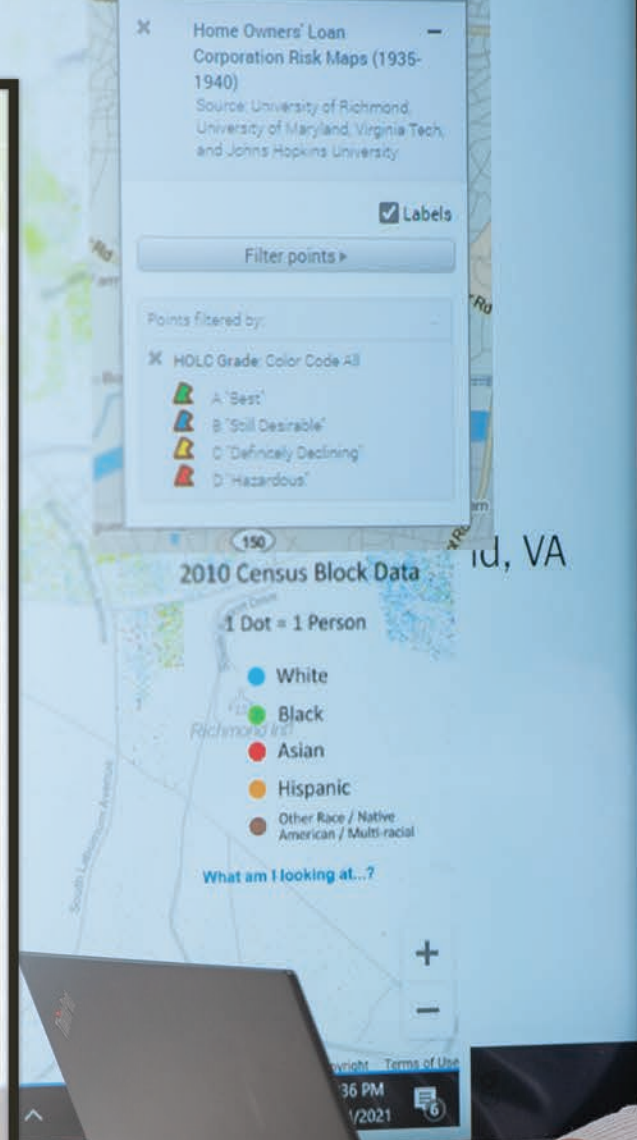
"Her work set the stage for my dissertation and current research program," said Hendricks. "She guided me through my graduate studies, the academic job search, the tenure-track process and most importantly she has been a friend, encouraging me to stand up for what I believe in, whether she agrees or not."

Van Zandt credits Walter Gillis Peacock and Forster Ndubisi, Texas A&M urban planning professors, as examples of the type of teacher and mentor she wanted to become.

"They challenged me to focus on my research while keeping the big picture in mind, and were very generous with their time, expertise and encouragement," said Van Zandt. "Walt helped me realize that disaster research was something I needed to be involved in, and Forster inspired my development as an administrator."

Hendricks credits Van Zandt for having a similar impact on his career.

"She is an intellectual leader in the fields of housing, social



Shannon Van Zandt uses the knowledge she gained from her mentors at Texas A&M to guide the next generation of planning students.



Van Zandt applies her planning knowledge as head of the REACH 12 Advisory Board. REACH aids low-wage contract employees at Texas A&M.

vulnerability, community development, disaster recovery and hazards,” said Hendricks. “Her work has been transformative in the lives of students, colleagues and in our profession. As a role model and trusted advisor, I couldn’t overstate the impact she has made on my life and career.”

Van Zandt’s big picture view of her role led to mentoring a former student who heads the REACH Project, a nonprofit organization that helps contract employees who work on the Texas A&M campus. Contract employees generally receive low wages and have unmet needs related to health care, food security, affordable housing, money management and education. Referred to as essential

Aggies, these workers include food service, custodial, maintenance and security guards who maintain the educational, research and daily living spaces of students, faculty and staff.

“I wanted to develop affordable, quality housing options for essential Aggies,” said Max Gerall ‘18, a communications graduate and co-founding CEO of the REACH Project. “Van Zandt’s name kept coming up as an expert with a passion for affordable housing, so I went to her office unannounced and waited until she could meet with me,” said Gerall.

Gerall shared his vision for the REACH Project and his notable accomplishments up to that point, and Van Zandt became his mentor,

friend, a champion for the cause — and later became a member of the project team.

“She challenged me to think broadly, to learn more about our community, and pointed me to resources that could help,” said Gerall. “We looked at research to discover what has worked and what hasn’t in developing affordable housing, and she introduced me to individuals and organizations whose missions could support our efforts.”

Van Zandt accepted a volunteer position as president of the REACH 12 Advisory Board, and she also heads the group’s housing consortium, which aims to create affordable housing for clients.

“Essential Aggies are so important to the success of the university, and many are second-generation employees who support our institution,” she said. “My involvement gives me an opportunity to support individuals and families that make Aggieland better, and it aligns with my personal and professional interests,” said Van Zandt, who has helped open doors for the organization and facilitated collaborative relationships.

“We are exploring the possibility of working with the university to build what we’re calling a learning village that would offer affordable housing for our clients, and educational and research opportunities for students,” said Gerall. “She has served as a

resource and mentor, and has helped me to develop as a leader.” Van Zandt has also had a hand in shaping the processes by which the organization operates.

“She is extremely thorough in everything she does,” said Gerall. “I get really excited and sometimes want to just push through, but she makes sure we’ve done our due diligence by researching options, making a strategic plan and creating a foundation for success. She’s really helped to position the REACH Project well.”

Van Zandt is poised to make a tremendous impact on in her areas of expertise through her interaction with students and peers as a teacher,

researcher, and mentor. Gerall and Hendricks are two examples in a long line of inspired and thankful colleagues.

“She is a compassionate, yet fearless leader and finds a great balance between being personable and facilitating productivity,” said Hendricks. “I can’t imagine how I would have navigated graduate school and my path to being a tenured professor without her input. Mentors matter, and she is one of the best!”

By Diane L. Oswald



Max Gerall ‘18, co-founding CEO of the REACH Project, at a REACH event. He’s a Van Zandt mentee who seeks her guidance as he aims to assist with essential Aggies’ unmet needs that include health care, food, affordable housing, money management and education.

A Two-Wheeled Solution

HOW CAN BICYCLES, A HEALTHY, LOW-COST FORM OF TRANSPORTATION, BECOME MORE MAINSTREAM?

Bicycles. They're often stashed in the garage until it's time to take them along on the summer camping trip. However, in parts of the U.S. and many places in the world, bikes are considered a practical part of daily transportation life. In some places, they're the best way to get to the office, to class, the drugstore — an efficient, everyday way to get from “here to there.”

In The Netherlands, 27% of all trips are made by bicycle, and adults average 74 minutes of cycling a week.

“It isn't that people in the Netherlands just love bicycles more than Americans, it's that bicycles are a common, cheap, fast, safe, and convenient way to get around,” said Tara Goddard, Texas A&M assistant professor of urban planning, who studies road safety for bicyclists, pedestrians, and other “non-car” users, as well as road crash reduction and sustainable transportation design.

There, and in other places where bikes are part of an everyday routine, such as Denmark and Portland, Oregon, bike riders enjoy the many benefits of riding that have been clearly identified by researchers — less

environmental impact than cars, less spending on transportation, and even more happiness, among others.

“Physical activity, fresh air, the human-scale interactions when we're biking are so different from the isolated bubbles we experience in vehicles,” said Goddard, citing numerous studies. “We look at each other face-to-face when we're walking or biking, we wave, we smell the environment, we hear birds sing. It's a whole-body experience.”

Researchers have learned that biking increases a body's serotonin, which has a positive effect on mood, appetite, and memory. Other “happy” brain chemicals such as dopamine and oxytocin are also increased by exercise.

But, in Texas and many other places, bikes often sit in the garage until that summer camping trip. The reasons, said Goddard, aren't surprising.

“Our land uses in Texas are spread far apart,” she said, “and road design in Texas is often very unfriendly for bicyclists.

“We have big, wide lanes, which encourages people to

Tara Goddard's research aims to show how and why bicycles should become an integral part of the U.S. transportation system.



drive fast,” she said. “This is both uncomfortable and unsafe for bike riders. We don’t have a good connected bicycle network, so you’ll be bicycling along and all of a sudden the bike lane, if there’s one in the first place, just goes away.”

“There’s plenty of research that shows a network of connected bike lanes makes a big difference in whether people bike or not,” said Goddard. “If you have a three-mile commute, and really nasty and dangerous intersections are part of that commute, it doesn’t matter that 95 percent of your commute is great, because that five percent is going to keep a lot of people from riding, which is fully understandable.”

Research by Goddard and other scholars also shows how bicycling is a “win-win” situation for societies and what’s preventing it from more widespread use.

PENNIES ON THE DOLLAR

The car has been the dominant form of transportation in the U.S. for many decades, but maintaining and improving automobile infrastructure is incredibly expensive, said Goddard.

“In most of the U.S., the reality is that people pretty much need to get in a car and drive someplace every day,” said Goddard. “We’re in terrible economic straits for it and our infrastructure is crumbling.”

The best (or worst?) example of the futility of expanding highways to keep up with the rising number of cars is the massive, \$2.8 billion Katy Freeway expansion in Houston. It was completed in 2011, but by 2014, commute times, bad to begin with, were even worse than they were before the expansion.

Bicycle infrastructure, on the other hand, is “pennies on the dollar,” said Goddard.

In addition to saving major amounts of public dollars, a scenario that includes bikes as a transportation staple

could also be great news for families’ bank accounts. The U.S. Bureau of Labor Statistics estimates that it costs almost \$800 on average to own and operate a vehicle per month.

“Imagine a household that could rely more on bikes for getting around every day and could then subtract one of its vehicles,” she said. “The savings would include gas money, a car payment, insurance, and major, pop-up expenses like repairs.”

SAFETY, SAFETY, SAFETY

There are more than 40,000 traffic deaths per year in the U.S. Of those, more than 6,000 are pedestrians and bicyclists. Alarming, pedestrian deaths have been increasing each of the last few years.

“It’s a public health crisis, but in the U.S. we don’t treat it that way,” said Goddard. Changing this perception is an uphill climb, especially when one considers that the public, as well as many journalists, tend to see fatal driver-bicyclist crashes from a motorist’s point of view.

In a first-of-its kind study, Goddard and a team of Rutgers University planning and public policy scholars found that patterns in crash reporting in news articles influence readers’ interpretation of what happened and who bears responsibility for the crash.

The study gauged perceptions of subjects who read articles about crashes with slight, but significant wording changes that changed the focus of the article from the pedestrian/victim to the car/driver.

“We found that shifting from pedestrian- to driver-focused language reduced victim-blaming and increased perceived blame for the driver,” said Goddard.

In the articles, for example, “A pedestrian was hit and killed by a car” was changed to “A driver hit and killed a pedestrian.”

“This does not incorrectly assign blame for the crash ahead of time, but it does correctly describe events and give agency to the driver, rather than the car,” said Goddard.

In a further example of this concept, Goddard gives the example of a hammer. “No one would ever say “a hammer hit the man”, but rather, “someone hit the man with a hammer.”

“Adopting simple improvements in crash reporting offers a potentially powerful tool to shift public awareness of traffic crashes from unfortunate, isolated events to a preventable public health issue,” said Goddard in a paper summarizing her team’s findings.

“Given the potential to save lives and prevent injury on a large scale, implementing more intentional writing patterns may be nothing less than an ethical imperative.”

Goddard is currently researching how drivers’ mindsets affects bicyclists’ safety.

“People are brought into a driving simulator and we have them ‘drive’ around a bicyclist while we measure their heart rate, their eye movement, their stress response,” she said. “Drivers are asked about their mindset and implicit viewpoint toward bicyclists.”

She’s learning how drivers’ behavior is affected by their perceptions of bicyclists: whether they just don’t like bicyclists, or whether they’re just nervous around them, she said. “We’re looking closely at this because we need to understand the specifics of driver behavior around bicyclists to devise the best measures to protect riders.”

THE HEAT IS ON

Research could also lead to measures to help bicyclists deal with Texas’ summer heat.

“It really is hard to get on my bike to go to campus, even if it’s just three miles, when the heat index is 105 degrees,” said Goddard — who tries to reduce her driving by riding

her bicycle to campus.

She has discussed a research project with Robert Brown, Texas A&M professor of urban planning, who specializes in microclimates — temperature, humidity, and other weather elements in a small, outdoor space.

Microclimate conditions are important, because they strongly influence people’s everyday decisions, such as whether or not to walk to work, garden in the backyard, or play sports in a park. Microclimatic design can create places that encourage outdoor activity by making places more comfortable.

Such a study would include an investigation of measures to cool bicyclists during the hot summer months.

“Maybe we don’t need as much of a cooling factor on straightaways, but anytime I have a long wait to get through a signal-controlled intersection, I think about how we could prioritize cooling for people who aren’t in vehicles, and research what kind of measures would work best,” she said.

A shade canopy of some kind? A misting station? Something less technology based, like trees and plants?

“We can research ways to make biking more pleasant and practical, not as a ‘war on cars’ or anything like that, but if people even took one or two trips a week by bicycle instead of by car, it would make a huge difference in everything from traffic congestion, the environment, and even our pocketbooks,” she said.

Not to mention happier people.

By Richard Nira

Taking Shape

THE QUEST TO MAKE IT EASY TO DIGITALLY RENDER ANYTHING

“Everything is a shape,” said Ergun Akleman, Texas A&M professor of visualization, as he considered questions about his years creating digital modeling software.

“Everything.”

Residential structures? Matchboxes? Cars? Water? They’re all “just” shapes. All of ‘em.

Akleman is on a mission to make it easy to digitally model all manner of shapes, a heroic endeavor that could potentially be used for everything from designing the perfect coffee mug to predicting where cracks will cause a building will fail over time.

PROTOTYPES AND PROBLEMS

Before the digital age, any sort of shape that designers created, a model of a commercial building, or something much smaller and mundane — a fob for a key ring, perhaps — was drawn by hand, then rendered in hand-constructed models made of wood, foam, or whatever substance best fit what was being conceived or developed.

Physical renderings of these designs required gathering raw materials and either possessing the skill to create a model, or hiring someone to do it. Of course there wasn’t just one design and one model for a project — new models and renderings needed to be created to reflect each design change, a time-consuming and potentially costly process.

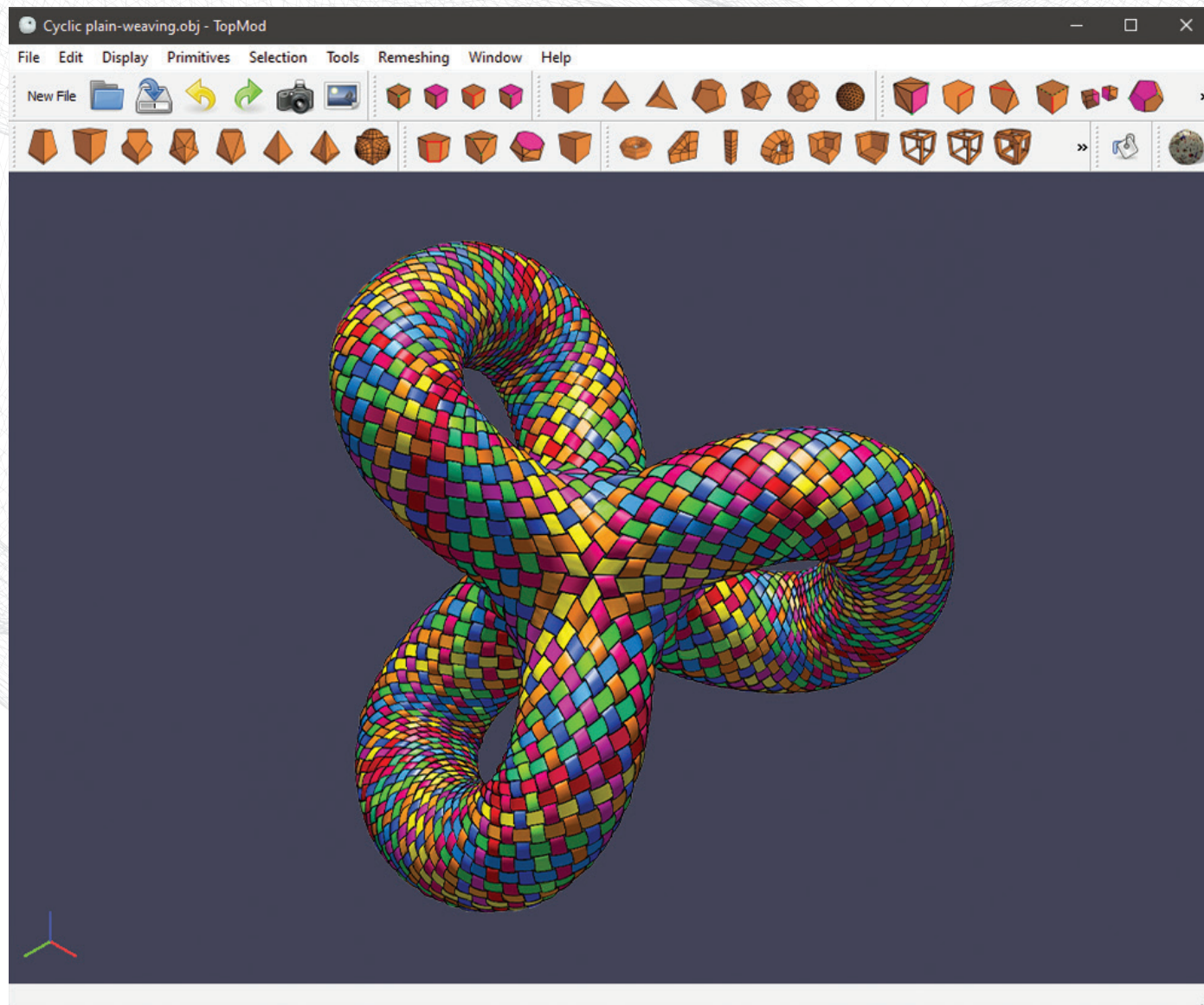
Digital technology offered the promise of simplifying and speeding up this workflow, but the complexity of “real-world” shapes and the lack of easy-to-use software was a daunting problem during the early days of consumer-grade computing, said Akleman.

Digital modeling would be practical if one could easily move, for example, a handle on a coffee mug or manipulate “holes” — such as doorways in a building, or virtually examine an object by turning it this way or that. But that software didn’t exist yet.

“When I first started digitally modeling objects it was difficult and complicated to do this,” said Akleman. “I wanted to be able to change things in an extremely simple way.”

Ergun Akleman is looking to build on his past successes at developing shape modeling software with an aim to make it as easy as possible for users to digitally render shapes of any kind.





With a background in mathematics and computer science, and funding from the National Science Foundation, Akleman and a team of computer scientists, software engineers, and computer graphics specialists created TopMod, an open-source application that was released in 2005.

AN INSTANT HIT

TopMod was an instant hit with users.

"People came up with so many shapes!" said Akleman. "It was really beyond my imagination what users created. Then they shared the shapes with each other and discussed how they created the shapes. It was incredible work and very exciting to see what TopMod made possible."

THE FUTURE OF DIGITAL DESIGN

Since TopMod's success, Akleman has been looking for ways to take the next step.

"I want users to be able to produce all possible shapes," he said. "Not just a few shapes. All possible shapes."

It's an ambitious-sounding goal, but it's one that Akleman is shooting for. Whether it be architects, medical researchers, clothing designers, or anything in between, designers in any field should have easy-to-use software

that will help them create whatever shapes they need to, he said.

To that end, he and a team of mathematicians, software engineers and developers have their eyes on the next prize: shape modeling 4D software that will render time-based changes in objects.

"It's a big step, but not a simple step," said Akleman, who is part of a team of software developers seeking funding for their idea.

Rendering objects in 4D instead of 3D can be thought of as the difference between rendering a running person and water, he said.

"Put simply, if you're modeling a person running, the action of running doesn't change a person's topology; there are certainly changes in the runner's body, but there's still two arms, two legs. The number and kinds of elements of a person in motion don't fundamentally change.

"But if you're modeling water, a 4D approach is the best way to render the changes water goes through," he said. "A 4D application will show time-based changes in the amount of water, its shape as it crashes onto a beach, for example."

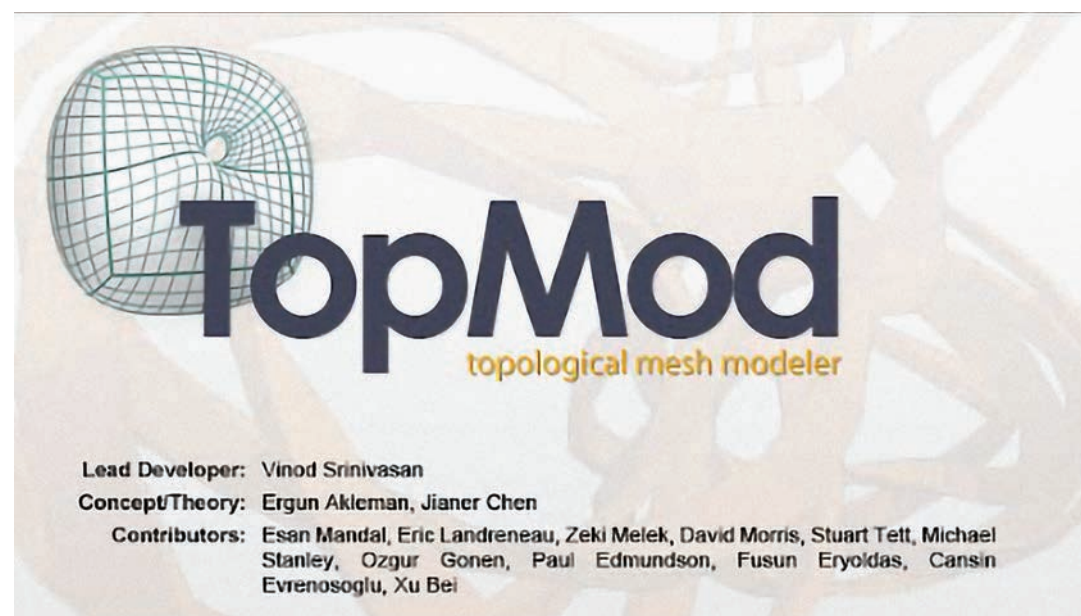
LIFE-SAVING PRACTICAL APPLICATION

In architecture, 4D modeling could also "see into the future" by rendering cracks that would eventually appear in a building after years of use. "Cracks can be very complicated, and might not even necessarily cause a building to collapse," said Akleman.

And, as is the case with 3D rendering, Akleman is looking to create software that will allow users to easily make changes to shapes, and then show the effects of those changes through time.

By Richard Nira

Akleman helped create TopMod, a pioneering, open-source shape modeling application in 2005.



Jobsites Versus Hurricanes

PROTECTING CONSTRUCTION JOBSITES FROM HURRICANE DAMAGE THROUGH AUTOMATION

The widespread unease that accompanies the menacing churn of an approaching hurricane is shared by construction managers, whose projects are exposed to a storm's fury.

A lot of damage can happen fast to a jobsite in a hurricane's path.

"Cranes and other heavy equipment are vulnerable to high winds or flying debris," said Youngjib Ham, Texas A&M assistant professor of construction science. "Loose materials, jobsite machinery, and equipment can become projectiles that wreak havoc on the site, machinery and surrounding areas."

Ham is addressing this issue by developing a groundbreaking, automated risk assessment system as an alternative to the industry's current practice of time-consuming, labor-intensive manual inspections.

His project, funded by a \$50,000 grant from the National Science Foundation, could help prevent some hurricane-related jobsite losses, which can easily run into the hundreds of millions of dollars.

There are, unfortunately, plenty of examples of catastrophic, hurricane-related jobsite losses.

In 2005, Hurricane Katrina caused \$275 million in damages at a New Orleans convention center jobsite.

In 2012, Hurricane Sandy caused more than \$185 million in damage to New York's World Trade Center construction project and nearby areas.

"Sandy's winds blew debris off the jobsite, damaging neighboring transportation systems and buildings, triggering serious economic losses in the city," said Ham.

In 2005, Hurricane Wilma's destructive path included \$4.2 million in damage to a construction project at the Miami International Airport's South Terminal.

Losses like these could get worse as climate change is expected to deliver more frequent, more intense hurricanes.

"The potential exists for increased hurricane-related jobsite losses due to climate change, and because a large portion of construction projects are in urban areas," said Ham, noting that two-thirds of the world's population is expected to live in these areas by 2050.

Ham's automated, risk assessment system that he calls "scene understanding technology" is intended to help construction site managers quickly identify the elements

Youngjib Ham is developing an automated system to quickly identify elements of a construction jobsite particularly vulnerable to hurricane damage.





Construction sites are especially vulnerable to a hurricane's fury.

of a site that are particularly vulnerable to hurricane damage so that action can be taken to minimize losses.

Ham's application starts with drone and handheld footage of the site that already exists as an ordinary part of the construction process. The app will "view" the footage, then utilize algorithms to convert the visual data into a simulation module that identifies sources of potential risk.

"The application will provide a crucial 'heads-up' for construction managers to quickly locate the risk of potential wind-borne debris prior to the arrival of hurricane-force winds and give them the time to implement proactive measures," he said.

"Automatically generated action plans customized for individual construction sites will help builders more efficiently protect their jobsites from severe weather events, which can reduce damage to minimize effects on their performance, profitability or productivity," said Ham.

The app will also create scenarios detailing the damage vulnerability of the site's surrounding areas — to crane damage, flying debris, etc., so that property owners and/or residents can prepare for the "fallout" from the winds at the site.

To develop the system, Ham did pioneering research at the Wall of Wind, a giant, 72,000 square-foot hurricane simulator at Florida International University that's capable of producing 157 mile-per-hour winds.

"I tested the effects of hurricane-force wind on models of construction sites in different areas; a high-rise area in downtown Miami, a suburban, low-rise location, and open terrain to determine the wind effects on jobsites in a variety of settings," said Ham.

"It's the first time such detailed experimentation regarding wind effects on construction sites has been conducted," he said.

His findings of the effects of hurricane-force winds on cranes in a high-rise area is the first of its kind, and, he said, "will result in a unique dataset of great value to the research community".

"Ultimately, this research will provide a crucial heads-up for construction managers to quickly locate the risk of potential wind-borne debris prior to hurricanes and quickly implementing damage prevention measures," he said.

Ham's project funding comes from the NSF's I-Corps program, which supports researchers looking to translate a promising idea from the research lab to the marketplace.

By Richard Nira



Youngjib Ham's wide array of research interests include "smart" cities' infrastructure systems and structures, information modeling and visualization, and human-robot interfaces in the context of infrastructure and construction management.



“Sustainability has to be beautiful.”

Saving the World With Waste

PROFESSOR FINDS PROFITABLE USES FOR INDUSTRIAL BYPRODUCTS

Not many people can say they have a love-hate relationship with waste.

An exception is Ahmed K. Ali, a Texas A&M associate professor of architecture who considers waste in his work and research. He has even dubbed himself “the wasteman,” as he says the moniker helps him start critical conversations around design, architecture, and sustainability.

“I love waste because I make use of it, but I also hate it at the same time and don’t want people to produce more of it,” he said.

Ali is on a mission to find creative and attractive solutions to industrial waste-flows and by-products, ways to limit waste in design, and move the world’s economy from one that produces billions of tons of waste, to one in which resources are used as long as possible for maximum value — the circular economy.

THE RUBBISH REALITY

“Waste is a modern idea; it’s not found in nature. We use more than 100 billion tons of raw materials worldwide each year in manufacturing,” said Ali, the founding director of [Texas A&M’s Resource-Based Research Design Lab](#). “Most of it goes to landfills. It’s not sustainable.”

Until recently, many companies simply sold their industrial waste and by-products as a commodity. It once was a \$57 billion industry in the United States. But new policies in Asian countries, the largest buyer of U.S. industrial waste, now restrict those imports, and American companies are having to deal with their own mess.

Other established recycling practices often use substantial energy, go unused or overlooked because they’re hidden away or seen as more expensive or a bigger hassle than they’re worth. This is why, according to Ali, the attractiveness of waste-based solutions is imperative.

“Sustainability has to be beautiful,” said Ali. “When we talk about using our existent resources, we must bring the idea of beauty to the forefront of the story.”

A LIVING WALL

A proof of concept of Ali’s ideas is a modular Living Wall, an innovative “green” wall made of galvanized sheet metal by-products, called offal, generated by the millions in the automotive industry.

With a \$300,000 competitive grant from Texas A&M’s Tier One program in 2017, Ali and Texas A&M faculty Bruce Dvorak, associate professor of landscape architecture, who helped plan the custom irrigation system and sourced

Texas native plants for the project, and Jorge Alvarado, professor of engineering technology, created a leap forward in “green” wall design and technology.

The partnership resulted in 300 diamond-shaped planters made of 20 tons of by-products sheet metal from General Motors Company on a custom built, 14 x 18-foot frame on building B of Texas A&M’s Langford Architecture Center. The invention is modular and can be used as a building skin.

In addition to the planters’ unique shape, design, and material, the frame they’re on is connected to Langford B at only a few points; because the frame holds the planters slightly away from the building, acting as a double building envelope, the Langford B wall is protected from damage caused by water from the planters or traditional felt or textile material in planters. The entire wall system is designed to be easily accessible, changeable, and sustainable. Planters are supported only by the law of gravity.

INSPIRED DESIGN

“As soon as the wall was up, it generated critical research questions from scholars across campus,” said Ali. “People from agriculture wanted to work with us to see how they could grow food vertically in cities. Water resources engineering wanted to collaborate on rainwater harvesting and wastewater irrigation. Other researchers from material sciences and engineering said they wanted to study the effects of bending sheet metal and energy savings.”

At the same time, students walking by started to take photos at the wall, and it became a popular campus picture spot. The buzz created more inquiries about the project, which has been featured in dozens of articles and journals.

This is the power of beautiful design, according to Ali.

“The waste discourse layer is a hidden part of the story that you don’t find out about until you ask questions,” said Ali. “The most important story is that it is beautiful, functional and it works. There is no subjectivity. Even if the plants are dormant in a season, it is still beautiful because it acts as a building skin. This beauty inspires further research and curiosity.”

Ali said innovative design thinking can inspire positive change, help solve global problems and build future generations of consciously-oriented designers.

“There is a misconception about architects that we are just responsible for creating a nice drawing or rendering,” said Ali. “But that is not all we are capable of. We can tackle some of the most challenging problems of the

world through design thinking and with our uniquely investigative architectural education, which allows us to think creatively about out of the box solutions.”

HIGH RISE DREAMS

Ali has filed patents for the Living Wall system, and is in talks with [Zahner](#), a world-renowned architectural metal surfaces company, about commercializing the product.

This could allow Living Wall systems to be incorporated with building skin systems into large-scale construction projects but also potentially available at home improvement stores like Home Depot or Lowes for smaller-scale use.

“We want to make this available to the public,” Ali said. “As a product in the market you could perhaps buy 50 of them and use them in your backyard or on your exterior walls for planting to grow vegetables and flowers.”

REFORGING SUPPLY CHAINS

As more and more people move to cities, Ali said these types of systems, which could be implemented along the sides of apartments or city buildings, could help grow food for residents instead of relying on already taxed shipping and transportation lines.

“The pandemic showed how fragile the supply chain is,” Ali said. “If you’re in an apartment in Dallas and the only way to get food is at the grocery store that relies on highway transportation, you could be in trouble. If we could grow our own food on city walls, and reuse material to reduce cost and make these systems affordable — it’s very exciting.”

To further explore global interdisciplinary innovations in the circular economy paradigm shift, Ali and his partners were awarded a \$50,000 Texas A&M Global Engagement Grant to develop a Global Collaborative Learning Environment for Architecture Product Innovation and Sustainable Manufacturing.

He’s been awarded additional T3 President’s Excellence Fund grants to explore other circular economy projects, including \$32,000 to work on solutions for college student homelessness and \$37,000 for a recently completed project for alternate uses for plastic waste technology, namely transforming computer microchip carriers known as matrix trays into building products.

His projects are also regularly funded by the industry including General Motors, Zahner and the United States Business Council for Sustainable Development.

CREATIVE DESIGN MINDS

In his design studios, Ali presents waste-related, theoretical, and real-life challenges to teach creative design thinking to his students.

While architects typically design and then figure out materials, Ali uses something he calls “synergistic means-oriented design” to put the materials first, such as manufacturing waste, and then identify an application to use it.

“When you give students this type of project-based assignments, they are excited to think about the problem, rather than just the goal of designing a building,” he said. “When they start with the waste problem, they have to learn about things that aren’t just architecture. They investigate ecology, manufacturing, steel production, industrial symbiosis, etcetera, before they design and start to employ creative design thinking to come up with solutions.”

Ali said the difference is “vast” when working with architecture students versus others.

“The design education allows you to be critical, incredibly creative, and constantly push boundaries,” he said.

Ali hopes to encourage that way of thinking in undergraduate and graduate programs by collaborating with colleagues in engineering, agriculture, and business on an interdisciplinary degree program that will allow

students from all colleges to collaborate and learn from each other for ideas to create a better, more circular economic future.

“This will help them when they graduate to be entrepreneurs and to have the skill to think about resources and positive impact on communities as they design or consider architectural projects,” he said.

EVERYONE WINS

Designing with waste-flow or by-product materials first has multiple beneficial applications, said Ali.

“Finding ways to use manufacturing waste can generate jobs and make new opportunities for people to start their own businesses,” Ali said.

“We aren’t just helping the environment, we are trying to help everyone win in this scenario, even those producing the waste,” he said. “Right now, factories see no value in it, but there could be a multifaceted impact not just for the environment but for the economy.”

Ali hopes to have more industries become open to creative, new uses of manufacturing waste.

“We can create solutions for your waste that you would never think of,” Ali said.

By Sarah Wilson



The Langford Living Wall, a unique structure made of 300 planters made from auto industry waste, sits on the Texas A&M campus on the side of Langford Architecture Center Building B.

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 innovation in 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 demonstrate undeniably 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, while the awards themselves serve to recognize the value of these professors' contributions to their students, industries, and communities of practice alike.

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.



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Birdwell holds the George W. Seagraves '80 Faculty Fellowship in Residential Construction.



LARRY FICKEL

Fickel holds the Donna Beth and Jim Thompson '68 Leadership Professorship.



DR. GREGORY LUHAN

Luhan holds the Ward V. Wells Professorship in Architecture.



DR. KC CHOI

Choi holds the Cecil O. Windsor, Jr. '66 Professorship in Construction Science.



DR. KEVIN GLOWACKI

Glowacki holds the David Woodcock Professorship in Historic Preservation.



GEORGE MANN

Mann holds the Ronald L. Skaggs Endowed Professorship in Health Facilities Design.



DR. MARK CLAYTON

Clayton holds the William M. Pena Endowed Professorship in Information Management.



DR. KIRK HAMILTON

Hamilton holds the Julie and Craig Beale '71 Professorship in Health Facilities Design.



DR. GALEN NEWMAN

Galen holds the Nicole and Kevin Youngblood Professorship in Residential Land Development.



DR. AHMED ALI

Ali holds the Harold L. Adams '61 Interdisciplinary Professorship in Architecture.



DR. CHARLES CULP

Culp holds the Liz and Nelson Mitchell Professorship in Residential Design.



DR. DAVID JEONG

Jeong holds the James C. Smith '70 Professorship in Construction Science.



MICHAEL O'BRIEN

O'Brien holds the Wallie E. Scott, Jr. Endowed Professorship in Architectural Practice and Management.



DR. AMIR BEHZADNAN

Behzadnan holds the Clark Construction Group, Inc. Endowed Professorship in Construction Science.



DR. BRUCE DVORAK

Dvorak holds the Landscape Architecture and Urban Planning Schob Scholar Professorship.



DR. PHIL LEWIS

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Peacock holds the Sandy and Bryan Mitchell Master Builder Chair.



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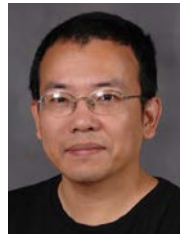
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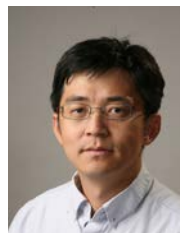
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Zhu holds the James M. Singleton IV '66, FAIA Educational Architecture Professorship.



DR. COURTNEY STARRETT

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DR. WEI YAN

Dr. Wei Yan holds the Mattia Flabiano III, AIA/Page Southerland Page Design Professorship.



DR. PATRICK SUERMANN

Suermann holds the Charles Dewey McMullan Chair in Construction Science.

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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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:

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