RESEARCH BLUEPRINT MILESTONES

IN CIVIL AND ENVIRONMENTAL ENGINEERING

UNIVERSITY of HOUSTON
CULLEN COLLEGE of ENGINEERING
Department of Civil & Environmental Engineering

Letter from the Chair

Dear Colleagues,

I hope that this message finds you safe and in good health. Despite the challenges presented by the novel coronavirus, our department has been hard at work in our continued pursuit of excellence in academia and research. I invite you to read through the following research breakthroughs, academic success stories and newly funded projects.

If you would like to learn more about how to support a project or collaborate with our department, do not hesitate to let me know.

Warm Regards,

Roberto Ballarini, Ph.D, P.E.
Thomas and Laura Hsu Professor and Department Chair
Civil and Environmental Engineering
Cullen College of Engineering
University of Houston

UH CEE **BY THE NUMBERS**

#64
BEST CIVIL ENGINEERING PROGRAM IN THE U.S.
**Source: US News & World Report*

TOP 100
ENGINEERING SCHOOLS IN THE NATION
**Source: US News & World Report*

22:1 UNIVERSITY-WIDE STUDENT TO FACULTY RATIO

270 UNDERGRADUATE STUDENTS

73 GRADUATE STUDENTS

343 TOTAL STUDENTS IN DEPARTMENT

**Student Totals are from Fall 2019 & Spring 2020*

35M+ IN RESEARCH EXPENDITURES AT THE CULLEN COLLEGE OF ENGINEERING

80% OF UH ENGINEERING UNDERGRADUATES ARE EMPLOYED WITHIN 1 YEAR OF GRADUATION

55 RESEARCH LABS, CENTERS, INSTITUTES & INDUSTRY CONSORTIUMS

CIVIL AND ENVIRONMENTAL ENGINEERING

IF CEMENT COULD TALK

A startup based on a UH civil engineering professor's technology could make the world safer.

When the 2010 Deepwater Horizon explosion, which killed 11 people and spilled almost 5 million barrels of oil into the Gulf of Mexico, was attributed to deficient cementing, **Cumaraswamy Vipulanandan** clearly saw the need for a better product.

"We addressed a universal need," said Vipulanandan, professor of civil engineering at UH, when he first described his work. "We figured out a way to make our research applicable to the real world."

The resulting smart cement was a new material, incorporating sensors into the mixture, enhanced through nanotechnology and surfactant technology and capable of reporting changes within the cement. That allows people monitoring the cement to determine if it has properly set or is weakening or cracking, among other performance variables. The smart cement is the basis for a new startup called Sensytec, which operates out of the UH Technology Bridge.

To learn more about Sensytec, please visit sensytec.com

CAN A NEW KIND OF POWER PLANT **IMPROVE AIR QUALITY, RESILIENCE?**

Hanadi Rifai, John and Rebecca Moores Professor of environmental engineering, is leading a $4 million project to study low-cost, low-emission electric power. The project, funded by the U.S. Department of Energy and located at the Southwest Research Institute in San Antonio, will demonstrate a new technology, known as Supercritical Transformational Electric Power, which can operate so efficiently that a desk-sized turbine is able to power about 10,000 homes. The research group will train graduate students on the technology to address three main goals:

1. Determine whether the technology can use waste heat produced by petrochemical and other industrial facilities to generate electricity

2. Assess the best opportunities for integrating the technology

3. Study deployment of the technology across the electric grid, focusing on emissions, water usage and how best to match plant scale to grid requirements. Rifai said some of the TCEQ funding will be used for specific components of the technology at the pilot facility in San Antonio, as well as to support data collection to gauge the technology's efficiency.

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UH RESEARCHERS IMPROVING RESOLUTION IN

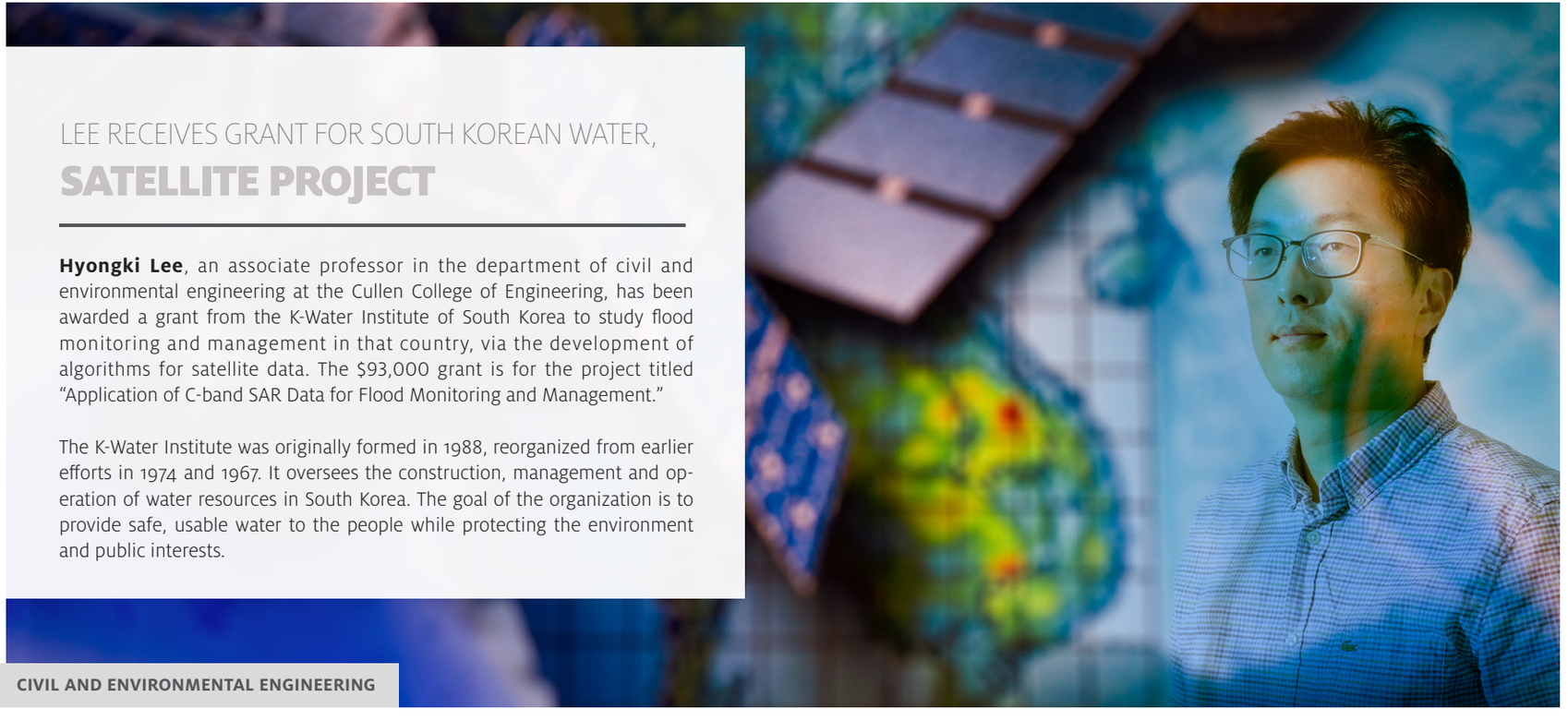
3D DATA COLLECTED BY DRONES

Researchers with the National Center for Airborne Laser Mapping at the University of Houston are using a $1.89 million grant from the U.S. Army Corps of Engineers to create a set of algorithms that would allow users to more precisely align datasets collected at different times and reliably estimate changes between images captured at different times. **Craig Glennie**, principle investigator with NCALM and associate professor of civil and environmental engineering at UH, said just-in-time data collected by drones can be helpful on the battlefield or in other circumstances. “More and more, people want to take older data and compare it to newer data and see if anything has changed, and there’s not really a mechanism to do that with any confidence.”

SHAFFER, REED **AWARDED GRANT TO STUDY HOUSTON WATER CONSERVATION**

Devin Shaffer, an assistant professor in the civil and environmental engineering department, will oversee the work done by his doctoral student, **Dana Reed**, in developing a model for water use and water conservation based on land use. In a competitive grant process, their proposal was selected by the Harris-Galveston Subsidence District (HGSD). The grant is for $24,228.

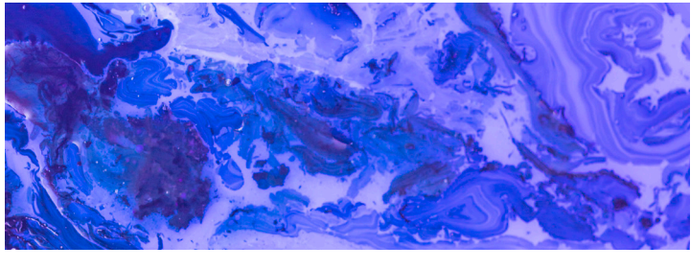
The ultimate goal, Shaffer said, is to develop a model that can used by the City of Houston to get the best return on investment when it comes to water conservation practices.



LEE RECEIVES GRANT FOR SOUTH KOREAN WATER, SATELLITE PROJECT

Hyongki Lee, an associate professor in the department of civil and environmental engineering at the Cullen College of Engineering, has been awarded a grant from the K-Water Institute of South Korea to study flood monitoring and management in that country, via the development of algorithms for satellite data. The $93,000 grant is for the project titled "Application of C-band SAR Data for Flood Monitoring and Management."

The K-Water Institute was originally formed in 1988, reorganized from earlier efforts in 1974 and 1967. It oversees the construction, management and operation of water resources in South Korea. The goal of the organization is to provide safe, usable water to the people while protecting the environment and public interests.



LOUIE, BERTÉ AWARDED GRANT FOR WATER CONTAMINANT RESEARCH

Stacey Louie, an assistant professor of civil and environmental engineering, has received a $12,000 grant to support work on how contaminants interact with water.

The funding comes from the Texas Hazardous Waste Research Center at Lamar University. The main objective of the research will be developing size exclusion chromatography (SEC) methods to investigate organic contaminant interactions with dissolved organic matter (DOM). Louie said the student working with her will be **Tchemongo Berté**.

CEE ADDS 3 NEW ASSISTANT PROFESSORS FOR FALL 2020 SEMESTER

The civil and environmental engineering department at the Cullen College of Engineering added three new assistant professors to its faculty for the Fall of 2020 – **Vedhus Hoskere**, **Xie Hu** and **Dimitrios Kalliontzis**.

Hoskere will start the Structures and Artificial Intelligence Lab (SAIL) at the college. His research investigates development of an automated inspection framework for buildings and viaducts using drones and deep learning methods.

Hu will be working at the National Center for Airborne Laser Mapping, which she described as a well-known geosensing institution and a draw when applying for a position. Hu uses radar imagery, taken from satellites or aircrafts, to measure the ground motion within millimeter accuracy.

Kalliontzis' research combines computational modeling techniques with laboratory testing to better understand how critical structures behave under extreme loading conditions.

The University of Houston
Cullen College of Engineering

The University of Houston Cullen College of Engineering addresses key challenges in energy, healthcare, infrastructure and the environment by conducting cutting-edge research and graduating hundreds of world-class engineers each year. With research expenditures topping $35 million and increasing each year, we continue to follow our tradition of excellence in spearheading research that has a real, direct impact in the Houston region and beyond.

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