



GALLOGLY  
COLLEGE OF ENGINEERING  
*The UNIVERSITY of OKLAHOMA*



# Annual Report

2021





# Annual Report

## 2021

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# Message from the Dean

I am pleased to share the 2021 Annual Report for the OU Gallogly College of Engineering. As I begin my second year as dean, I continue to consider myself fortunate for being part of a dedicated community of faculty, staff, students, supporters and alumni who have been extraordinary in these challenging times.

We are responding to the ongoing need to produce more engineers, not only for the state of Oklahoma, but for our nation and world. From 21 new faculty in 2021 and plans to hire an additional 25 faculty by 2024, the college continues on a trajectory to serve more students in the coming years.

In addition to an anticipated increase in undergraduate and graduate student enrollment, the college is implementing a new program to enhance retention and degree completion. The program, Engineering Pathways, formalizes our focus on recruitment, retention, and graduation of engineering students and employs faculty and staff experts in these areas.

The college's strategic plan aligns closely with the university's strategic plan pillars and outlines the growth of the college, and provides enhancements in the areas of research, recruiting and retention, instruction and workforce preparedness.



The OU Gallogly of Engineering is prepared to take the college to the next level of excellence in its mission to students and its impact in a growing research enterprise.

Thank you.

**John Klier, Dean and AT&T Chair**

Member of the National Academy of Engineering  
Member of the National Academy of Inventors

## Strategy

The college strategic plan was updated and reconciled with the university strategic plan in the summer and fall of 2020. The update process included a point-by-point reconciliation with the university strategy, updates to fully address the university strategy, full stakeholder engagement and approval (faculty, alumni, students), as well as university review in spring 2021. The strategic plan is driven by two key imperatives: (1) achieving Association of American Universities

research performance; and (2) achieving 200 new graduates per year for Oklahoma's economic development. The resulting college strategic plan includes four key elements: (1) growing the college; (2) enhancing research; (3) enhancing recruiting and academic preparation and (4) enhancing instruction and workforce preparation.

College Strategic Plan	OU Lead On Strategic Plan Pillars					
	Become a Top-Tier Public Research University	Prepare Students for Success, Meaning, Service, and Impact	Make OU's Excellence Affordable and Attainable	Belonging and Growth for Students, Faculty, Staff and Alumni	Impact Oklahoma, Nation and World through Research and Creative Activity	
Grow College	✓	✓	✓	✓	✓	
Enhance Research	✓	✓	✓	✓	✓	
Enhance Pathways & Support	✓	✓	✓	✓	✓	
Enhance Instruction & Workforce Prep	✓	✓		✓	✓	

# Hiring



A key component of the strategic plan involves growing the college faculty. College growth is essential for several reasons: (a) to bring teaching loads – historically well above AAU benchmarks – in line with benchmarks in order to enhance research and improve student experience and retention; (b) create research clusters to propel the research mission; and (c) enhance first-year student experience to improve preparation and retention.

During the past year, the college hired 21 new faculty and four new staff to support college growth. To support the strategic plan, the university and college secured a state investment of \$5 million per year to support the hiring of approximately 47 new faculty and 17 new staff over the next four years.

# Space

As the college grows to address instructional and research strategic imperatives, we quickly recognized a rapidly looming space shortage. In order to address this need, the college mobilized to develop projects generating approximately 60 new offices and 50 new laboratories needed for new faculty and new staff in the next four years. We are also providing support for first-year instruction to students as part of the Engineering Pathways Studio.

These projects were tiered into near term (Tier 1) through mid- and long-term (Tier 2 and 3). Financing for these projects was obtained through fundraising (mainly Tier 1), loan from the

university (Tier 1), state appropriations (Tier 2) all for critical research and office space. This includes plans to renovate and establish a student pathways facility for instructional faculty to help with student preparation and retention. Loans will be closed with ongoing fundraising efforts.

Approximately 25 new faculty offices, seven staff offices and 17 new laboratories currently are underway. They include Tier 1 projects, and the fourth floor of Gallogly Hall with additional projects being initiated.

# Recruiting and Academic Preparation

Recruiting efforts have resulted in a 15% increase in admissions and we are tracking ahead of last year in early commitments. Along with enhanced recruiting, several departments are implementing or expanding new master's degree efforts.

Enhanced academic preparation is critical to student success and retention. The following projects are underway: (a) remodeling first-year engineering course to boost critical math skills, spatial reasoning skills and project success for a fall 2022

launch; (b) implementing an enhanced supplemental program – the Engineering Catalyst Program - to provide math, critical transfer students; (c) enhancing undergraduate advising. In addition, (d) the college has enhanced a new graduate student onboarding and support program that will continue to grow. Finally, (e) a comprehensive new faculty onboarding and mentoring program was implemented to boost faculty engagement and research collaboration.

## K-12 Outreach and Recruiting

Our current outreach activities include OU Engineering GLAMS (Girls Learning and Applying Math and Science), Engineering Days, Engineering Days for Educators, Engineering Open House and visits to schools and visits from schools to the Rawl Engineering Practice Facility with hands-on activities,. Our recruitment team offers Gallogly College of Engineering tours daily and personalized visits. Retention efforts include first- and second-year course redesign, and will introduce a new Engineering Catalyst Program, an alternative pathway for highly motivated, at-risk engineering students.

We are also enhancing recruiting efforts. We brought on Dalton Brasington to lead recruiting efforts. Seventeen college students now work as outreach and recruiting ambassadors. Brasington and his team reach out to high schools and communities across the state. To date, efforts have resulted in: (a) attending 32 large or multi-school college or career fairs; (b) 21 schools participating in outreach activities; (c) taking part in 10 events with the OU Office of Admissions and Recruitment; (d) visiting eight high schools; (e) making 2,400 phone calls; (f) creating recruitment videos; (g) contacting 1,800 students via email campaigns (45% open rate), and (h) disseminating messages from each of the seven school directors.



Dalton Brasington

## Transfer Pathways

New transfer pathways are being implemented. They include a joint program with Cameron University (Lawton, Oklahoma) to support mechanical engineering students that will allow students to complete their third year at Cameron, augmented by OU coursework, before joining OU in year four. The School of Computer Science has established a 2+2 program with Tulsa Community College. The Gallogly College is building new 2+2 programs with Rose State College.

## Graduate Student Recruiting

Our graduate recruiting initiatives are led by Dominique Pittenger. She has developed recruiting resources such as brochures, as well as audited webpages and toolkits. She is leading recruiting efforts for internal bachelor's/master's degrees, as well as targeting regional and national recruiting at colleges, the American Indian Science and Engineering Society fair and other conferences.



Dominique Pittenger

Pittenger also is creating a database for tracking activities and measuring efficacy. Key activities for spring 2022 will include developing an integrated marketing and communication plan along with departmental specific recruiting resource repository.

# Recruiting and Academic Preparation

## Engineering Pathways

The Gallogly College of Engineering has an ambitious goal to grow our student body in order to meet the growing need for engineers. We are committed to producing the best prepared engineering graduates who are equipped to contribute solutions to the complex challenges faced by our state, region and nation.

The Engineering Pathways Hub is an essential component in meeting our strategic goal to grow engineering enrollment and degree completion. The Hub will provide a collaborative environment for engineering faculty to develop new and innovative ways to improve student recruitment, learning, and retention.

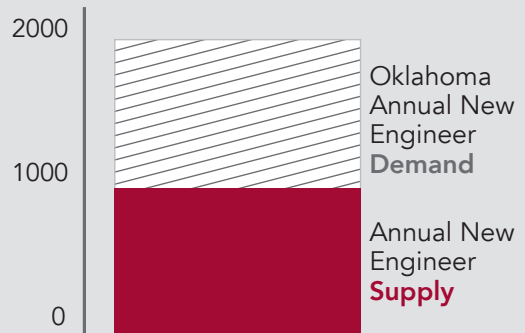
The programmatic space on the second floor will house the Engineering Pathways Studio, an active-learning, team-based instructional facility that provides a dedicated space for first- and second-year project-based learning. The classroom will have a capacity for nearly 60 students and includes an adjoining project meeting area for class break-out groups or informal student meetings throughout the day. Students will have access to advanced instructional technology and will be able to utilize the Studio space in and out of the classroom for team-based project work.

Our approach to this challenge is multifaceted and is developed on evidence-based practices and research in engineering education. We are hiring world-class faculty who are experts in engineering education or in technical areas of engineering research; we are aggressively recruiting new students from across the state of Oklahoma and the region; we are expanding and developing programs to support student success; and we are focused on providing our students with new and improved opportunities to develop their academic knowledge and professional skills. This is an unprecedented opportunity to transform engineering at the University of Oklahoma.

To formalize our focus on recruitment, retention, and graduation of engineering students, we have created the **Engineering Pathways Program**. The program employs faculty and staff experts in the areas of outreach, recruitment, and retention, and is actively supported by 17 GCoE students working as Sooner Engineering Education Center (SEED) Scholars and GCoE recruiters. The new faculty hires in engineering education will add energy and new ideas, teaching excellence, and student mentorship to the Pathway's Program, providing essential support for our mission to grow our engineering student body.

## BRIDGE THE GAP

Despite our efforts to provide well-prepared engineers, the Gallogly College of Engineering anticipates a significant shortage of engineers over the next five years – as many as 1,000 engineers per year are needed.\* At OU, we are working to bridge that gap. That's why both the state of Oklahoma and OU are committed to adding more than 50 new faculty positions within the next five years. OU Engineering welcomed 18 new faculty members this academic year.



New engineering faculty translates to potentially enrolling more than 1,000 new students in the Gallogly College of Engineering. However, students and faculty both need space – especially space for hands-on instruction.

\* GCoE estimated gap in 2026.



# Recruiting and Academic Preparation

Enhanced academic preparation is critical to enhancing student success and retention. We are expanding and adding new programs to better support engineering students.

## Expand AT&T Summer Bridge

The 2022 AT&T Summer Bridge Program is a four-week on-campus experience in the summer for freshman students who have been accepted to OU and who are planning to major in an engineering discipline. The program involves academic programming, personal and professional development, engineering identity building and community formation. We are expanding staffing, working on intentional recruiting and working with the college's advancement team to identify industrial partners to sustain and expand Summer Bridge 2023 and beyond.

## Revamp First-Year Program

Our college is reimagining its First-Year Engineering Program to help freshmen develop a passion for engineering and to become part of a supportive community. This includes remodeling the first-year engineering course (1411) to boost critical math skills, spatial reasoning skills and project success (launch is fall 2022). Students also are mentored by peer volunteers from the Dean's Leadership Council. We continue to develop plans for continuous engagement with freshmen throughout their first year.

## Implement Engineering Catalyst Program

We are implementing an enhanced supplemental program – the Engineering Catalyst Program - to provide math, critical thinking and mentored research skills. The program provides year-long support for highly motivated, less-prepared, less-resourced or less-confident students to achieve success as an engineering student. This program provides an alternative pathway to an engineering degree. It includes community building, academic support and early skill building. Elements include a math catalyst – supplemental math instruction embedded with engineering problems situated in science and math contexts, as well as a research catalyst that provides early development of research skills.

## Enhance Undergraduate Advising

Robust advising is critical to student engagement and retention. The advising team, with leadership from Jeremy Peña, has taken key steps in enhancing the advising process. The team

created student/advisor responsibilities that were posted on the college's website and emailed to all students. The team reviewed student data in the first year of study focusing on key engineering courses (MATH, CHEM, PHYS) to inform interventions. They implemented an email series to continue engagement with students (tips, deadlines, etc.) and created an Instagram account specifically for the Williams Student Services Center that is based in Felgar Hall.



Jeremy Peña

This year, four advisors participated in University College's New Student Orientation, to provide first-year advising for incoming engineering students. Advisors participated in the engineering orientation courses to familiarize students with services offered. Academic coaching sessions are provided as a service to students who are struggling and need enhanced advising. Advising staff receive this training in order that they may improve upon coaching techniques and incorporate them into advising practices, specifically the core persistence themes including: (a) study system; (b) major to career design; (c) health and resiliency; (d) financial confidence; (e) support networks; (f) competing responsibilities; (g) motivation and achievement; and (h) identity and inclusion. Staff are enrolled in Aspiring Ally Training and additional diversity and inclusion training, as well as STEM Career Training (potentially led by faculty).

## Enhancing Graduate Student Onboarding and Support

Graduate student onboarding and support is a key element to enhancing graduate student success and retention. This program is led by Allison Quiroga. Key activities started in fall 2021 include a new graduate student welcome, assisting departments with handbook updates and a community international food festival lunch. In spring 2022, Quiroga will develop strategies for graduate student leader engagement working in sync with the dean's office, as well as create course plans and material for a first-semester introductory seminar. The seminar will be introduced and piloted in fall 2022.



Allison Quiroga

# Education and Workforce Preparation

Enhancing workforce preparation is a key component of producing more well-prepared engineers. The college is developing enhanced undergraduate research opportunities for undergraduate students. Undergraduate research, along with ongoing competition teams, capstone and internship opportunities, provides valuable hands-on and team-based training for students. It also correlates with enhanced retention and provides excellent preparation for the engineering workforce.

Key elements of our strategy include expansion of undergraduate research beginning in spring 2022 and fully implemented by fall 2024. The college is developing opportunities for research for all of our student body. The research catalyst will provide training and development of fundamental research skills; course-based research will embed research into the curricula to ensure that all students have the opportunity to participate in research; and faculty led research

will bring students into faculty research labs. In addition to hands-on engineering experiences, our students benefit from supplemental professional skills offerings in the Jerry Holmes Leadership Program. The offerings help prepare students with business and leadership skills that are critical to job success. We are working to expand offerings that provide specialized tracks that address challenges for modern engineering practice: sustainability (fall 2022 launch), technology and society (spring 2023 launch), diversity, equity and inclusion (spring 2023 launch), and business and entrepreneurship (fall 2023) launch.

We continue to grow in our online education presence. We have expanded from three to five online master's degrees, adding computer science and industrial and systems engineering this past year. We also introduced an online undergraduate certificate in Data Science and Analytics to prepare our graduates for data-driven problem solving in engineering practice.

# Fundraising and Alumni Engagement

Fundraising is a critical component of strategy execution. New funds are needed for teaching and research space, scholarships and endowments to help propel teaching and research aspects of strategy. In 2021, the advancement team raised approximately \$11.5 million of new fund pledges in

the calendar year, with \$1.01 million for renovations including \$645,000 of cash payments (see table below). This includes funds for multiple renovations benefiting the schools of Aerospace and Mechanical Engineering, Chemical, Biological and Materials Engineering, Computer Science and Industrial and Systems Engineering. Fundraising activities have included significant efforts by college and school leadership to engage with prospective donors in multiple forums across the nation.

We have renamed our Board of Visitors to Board of Advisors. To drive college strategic priorities, we have engaged an active group of alumni leaders in standing committees to advance efforts in student affairs, research and technology and external affairs/fundraising.

**List of Alumni Abbreviations:** ISE- Industrial and Systems Engineering, CHE-Chemical Engineering, CORP-Corporate, AME- Aerospace and Mechanical Engineering, CS-Computer Science, PE-Petroleum Engineering

ALUM	DATE	PLEDGE AMOUNT	CASH PAYMENT	PROJECT TARGET
ISE	DEC '20	\$45,000	\$45,000	ISE renovations
ISE	APRIL '21	\$50,000	\$10,000	Felgar unrestricted
CHE	JUNE '21	\$25,000	\$5,000	CBME renovations
CORP	JUNE '21	\$200,000	\$200,000	REPF-B4
AME	JUNE '21	\$25,000	\$5,000	AME renovations
ChE	JULY '21	\$100,000	\$25,000	CEC 401 (CBME)
CS	JULY '21	\$200,000	\$200,000	DEH 210
AME	AUG '21	\$100,000	\$100,000	AME renovations
CHE	SEPT '21	\$30,000	\$6,000	CBME renovations
CHE	SEPT '21	\$50,000	\$10,000	CBME renovations
CHE	SEPT '21	\$40,000	\$10,000	CBME renovations
FACULTY	SEPT '21	\$20,000	\$4,000	Felgar unrestricted
PE	OCT '21	\$125,000	\$25,000	Felgar unrestricted

**Total \$1,010,000**

**Total \$645,000**



# Research

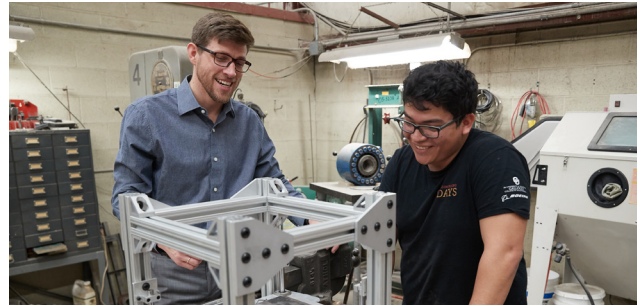
Growing research productivity, reputation and impact is key to achieving Association of American Universities aspirations and propelling Oklahoma's economy. College research expenditures per faculty have tracked at approximately half of peer AAU institutions. To close the gap and enhance research, we have taken several key steps, including: (a) defined research clusters with potential for a Top 10 position; (b) hired to build clusters; and (c) supported clusters (along with the Vice President for Research and Partnerships office) with transdisciplinary proposals, industrial connections and cluster leadership, as well as pending actions, including grant-writing support, grant training (that includes the Small Business Innovation Research program) and financial incentives.

Our strategic approach is already paying dividends. In the past year, the college achieved a 35% increase in awarded grant dollars with over a 50% increase in total grant value. The college secured many grants, including a \$20 million grant to lead the inaugural National Science Foundation Artificial Intelligence Institute and \$5 million from the U.S. Air Force for sustainment research projects.



## Build Research Clusters

Building collaborative research clusters is a recognized best practice in accelerating research output and impact. Accordingly, the college is leveraging our hiring plan and financial support to secure faculty who can build and support research areas that support a Top 10 program. We have identified 12 areas where investments will ensure that the college be world class. Additionally, the clusters leverage collaborations with partner institutions such as Tinker Air Force Base, regional aerospace industry, the OU Health Sciences Center and state institutions. To date, we have hired faculty in quantum technology, advanced manufacturing, data science, energy management, adaptive infrastructure and immunoengineering.



## Support Research Clusters

Our college supports each research cluster, helping each become productive and impactful. Activities underway include: (a) established cluster leadership roles; (b) worked with the vice president for research partnerships to develop and submit cross college cluster proposals; (c) implementing aggressive fundraising for equipment, maintenance and faculty leadership compensation; (d) and establishing partnerships with other OU colleges to request strategic hires for clusters. Plans are underway to: (e) provide training on Small Business Innovation and Small Business Technology grants; (f) establish strategic partnerships for multi-university large grants; (g) and establish departmental support practices including course release and graduate assistant support to facilitate cluster leadership activities.

## Enhance Industrial Partnerships

Enhancing industrial collaboration is critical to boosting research funding, increasing impact on Oklahoma industries and providing internship and employment opportunities for graduate and undergraduate students. Currently, less than 10% of college research activities come from corporate sponsors. To aggressively expand collaborations, we have created a leadership position within the college. Interim Associate Dean Sridhar Radhakrishnan is leading the initiative and is creating opportunities for companies to engage with faculty and with each other. He also is implementing a college Industry and Government Day in April 2022 in partnership with the Office of the Vice President for Research and Partnerships to boost research, employment and internship collaborations. In progress are efforts to broaden our industry collaborations beyond Oklahoma.

# Research Highlights



## McGovern to Lead \$20 Million NSF Artificial Intelligence Institute

Amy McGovern, an OU professor with dual appointments in the School of Computer Science in the Gallogly College of Engineering and in the School of Meteorology in the College of Atmospheric and Geographic Sciences, will lead the NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography.

"We are thrilled that OU is leading this first-of-its-kind national research institute and that our own Dr. Amy McGovern was selected to spearhead the effort," said OU President Joseph Harroz Jr. "By leveraging our nation's leading AI experts across multiple disciplines and industries, the discoveries produced by this team will revolutionize what we know about weather and our environment – all of which directly ties to one of OU's core traditions of harnessing breakthrough research to advance society."

"At OU, researchers are driving convergent solutions to solve global challenges," said Tomás Díaz de la Rubia, OU vice president for research and partnerships. "Dr. McGovern and her collaborators' work is a perfect representation of how the OU research enterprise moves beyond traditional boundaries, across disciplines and across institutional boundaries to create solutions. This multi-sector approach will accelerate transformative change in the development and use of trustworthy AI. It will improve the nation's understanding of severe weather and ocean phenomena, save lives and property, and increase societal resilience to climate change."

Read more: <https://bit.ly/OUmcGovern>



## Nairn's Work on Tar Creek Featured In America's Most Endangered Rivers

For over four decades, Tar Creek in northeastern Oklahoma has been off-limits for fishing, water sports and other outdoor recreational activities.

The well-publicized Tar Creek Superfund Site in the Tri-State Mining District (an area that also includes portions of southeastern Kansas and southwestern Missouri) originally produced lead and zinc to make bullets during both World Wars. Toxic mining waste, containing lead, zinc and cadmium – known locally as "chat" – was left on the surface of the site when mining operations ceased in the 1970s. Cleanup of the over 30 million tons of chat continues to this day.

The site, once the world's largest lead and zinc mine, has turned Tar Creek orange, killed the aquatic life and continues to threaten human health with heavy metals, specifically iron, zinc, lead, cadmium, arsenic and manganese. Some 1 million gallons of contaminated water per day are discharged into Tar Creek, a tributary of the Neosho River, which joins the Spring River to form the Grand River. Tar Creek and the Grand River feed a major drinking water source for thousands of Oklahomans.

"Professor Nairn, an OU professor in the School of Civil Engineering and Environmental Science, and his students have been great partners over the life of this project," said Scott Thompson, Oklahoma Department of Environmental Quality executive director. "They have demonstrated that substantially improving water quality is possible, even at a very large mining site."

Read more: <https://bit.ly/OUNairn>



## OU STRATEGIC RESEARCH VERTICALS

### COLLEGE RESEARCH CLUSTERS

COLLEGE RESEARCH CLUSTERS		Aerospace, Defense and Global Security	The Future of Health	Environment, Energy and Sustainability	Society and Community Transformation
<b>Manufacturing</b>	Digital Advanced Manufacturing	✓	✓	✓	
	Advanced Polymers & Coatings	✓		✓	✓
<b>Sensing</b>	Radar	✓		✓	✓
	Quantum Sensing	✓	✓	✓	
<b>Healthcare Technologies</b>	Medical Imaging		✓		✓
	Delivery & Immunotherapy		✓		✓
	Biopharma Manufacturing		✓		✓
<b>Infrastructure Technologies</b>	Water		✓	✓	✓
	Hydrogen			✓	✓
	Energy Management	✓		✓	✓
	Data Science	✓	✓	✓	✓

## Build and Improve College Space

Hiring of over 50 faculty and 17 staff over a five-year period requires significant facility investment. Prior to 2021, the college was nearly at capacity with limited room for expansion. Hence, we have aggressively increased efforts to renovate and expand our research and instructional footprint. Approximately 25 new faculty offices, seven staff offices and 17 new laboratories are underway. These include Tier 1 projects, as well as the fourth floor of Gallogly Hall, with additional projects being initiated.

### Key Efforts Include:

(a) Secured investments from state appropriations and Dolese Bros. Co. to invest in a new south campus research and instructional building. The first wing of the building is projected to house the transportation research clusters. The new space frees up room on the main campus. Planning has started with a fall 2023 completion expected for the first wing.

(b) Expanded fundraising (advancement) team to five professionals. Their highest priority is fundraising for facilities. Over the past year, they raised over \$645,000 toward facility needs.

(c) \$4 million invested by OU for the renovation of the fourth floor of Gallogly Hall. Work has started with an expected completion for fall 2022.

(d) Secured loan for renovation of underutilized storage areas to convert to useable research and office space. Currently, there are five ongoing Tier 1 projects that will generate significant new research space starting in fall 2023. A key example is the renovation of Room B30 in Devon Energy Hall that will serve as a core wet lab research facility.

(e) Collaborating with VPRP for a new Oklahoma Aerospace and Defense Innovation Institute (OADII) to house aerospace and defense-related research, to support advanced manufacturing, embedded software programs and an expansion of the Radar Innovation Laboratory. The facility represents an investment exceeding \$20 million with anticipated completion of fall 2024.

(f) To support research growth in radar, OU and VPRP will provide additional support for an expansion of the Radar Innovation Lab Annex.

(g) VPRP and the college is renovating a 4,000 sq. ft. space for metal additive manufacturing research.

(h) Upgrade to infrastructure on fourth floor of Carson Engineering Center to have a collaborative research space for polymer and composite cluster. The upgrade will provide infrastructure for additional fume hoods, safety and other equipment.

# Contact Information

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From left: Randa Shehab, Zahed Siddique, John Klier and Sridhar Radhakrishnan

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