



October 1, 2020

RESEARCH UPDATES

\$2M NSF PROJECT EARTH GRANT ANNOUNCED



We are thrilled to announce that Prof. Mark Shiflett and Prof. Aaron Scurto were recently awarded a \$2 million NSF grant from the Emerging Frontiers in Research and Innovation (EFRI) division. [EFRI](#) is a branch of the National Science Foundation (NSF) which "pursues cutting-edge,

interdisciplinary research with the potential for transformative impacts on national needs and grand challenges." The goal of this research is to study the separation and recycling of high global warming potential (GWP) refrigerant mixtures.

Project EARTH (Environmentally Applied Research Towards Hydrofluorocarbon) will use a combination of experiments, advanced computer simulations, and rigorous analytical methods to discover, synthesize, and test ionic liquids that are efficient at separating azeotropic hydrofluorocarbon (HFC) mixtures. The research will be conducted by a team of researchers located at the University of Kansas (lead institution), the University of Notre Dame, Texas A&M University, and Rutgers University in collaboration with Brookhaven National Lab, Oak Ridge National Lab, and the National Institute of Standards and Technology along with two industry partners (Chemours and Iolitec).

Click on the Project Earth image below to watch a short video.

Learn more @ <https://shiflettresearch.com/>

PROJECT EARTH

The Shiflett Research Group

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JENNY ROBINSON GROUP UPDATES



Dr. Robinson was a co-editor in a special issue of the journal "Tissue Engineering: Part A" titled *Tissue Engineering for Women's Health*. The issue came out in June 2020. [Click Here](#) for a link.

Earlier this year, The Robinson Lab, along with Dr. Donna Pacicca (pediatric orthopedic surgeon, Children's Mercy Hospital) and Dr. Emily Farrow (Director of Laboratory Operations at the Genomic Medicine Center, Children's Mercy Hospital) were awarded a pilot grant through the KUMC Frontiers CTSA to determine unique meniscal cell progenitor populations in male and female patient samples using single cell RNA seq.

Follow the Robinson Lab using Twitter (@Prof_JRobinson)



Transforming Graduate Training and Building Research Capacity at KU

Making bold changes to graduate education is not easy. Integrating disciplines is even harder.

Yet, since today's graduate students will become tomorrow's innovators, we must prepare them to address the many problems plaguing society. To do this effectively, universities need new training models that span traditional boundaries and broaden participation.

The University of Kansas aims to do just that with a prestigious National Science Foundation Research Traineeship (NRT). Now in its second year, the "Internet of Catalysis" NRT program is working to transform graduate education in chemistry and engineering.

Kevin Leonard, associate professor of chemical and petroleum engineering leads the five-year project. He is also one of several faculty members mentoring the first cohort of seven trainees.

"Since last January, we have been training these graduate students how to collaborate with each other," said Leonard, "and the results so far are very exciting."

One of the NRT's main goals is to foster research that is student-driven instead of faculty-driven. The hope is that this training approach will empower students to grow as leaders, while also helping to bridge the gap between data science and chemical catalysis—two fields that historically have had little in common. Achieving this goal will enhance students' skills and grow research capacity at KU. The results could lead to major breakthroughs in urgent areas such as renewable energy and cleaner chemical processes.

To harness the power of data science, the NRT trainees learned Python, a programming language. This was initially quite challenging, but many students grew to like it.

NRT trainee, Emily Mikeska struggled to code at first. Coding is not a common skill for chemistry majors. The NRT program convinced her of its value. She now writes code to automate time-consuming research tasks, like analyzing crystal structures.

"I genuinely enjoy [coding] now," says Mikeska. "[A] survey of 500 crystal structures will never take me as long as it used to!"

Since catalysis is a specialized field, no computer algorithms currently exist that can correctly identify its unique terminology. Therefore, trainees' first had to create such an algorithm.

"This accomplishment significantly advances the project," said Leonard, "taking us closer towards developing an automated method to extract data from catalysis literature."

In addition to research, the NRT team has created a new course, revamped two others, and developed multiple workshops. Dozens of students and postdoctoral researchers have benefited from these training sessions, which cover topics like career planning, teamwork, communication, resilience and unconscious biases.

The NRT program also seeks to make KU more welcoming and inclusive. The team employs evidence-based strategies for inclusion in all of its training activities. A new Inclusion Advisory Council is guiding NRT initiatives. NRT leaders are also working hard to recruit students who might feel excluded from science and engineering because of their race, ethnicity and gender.

"Embracing diversity and inclusion makes KU stronger, and it fuels innovation," said Leonard.

Master's and doctoral students in chemistry, chemical engineering and computer science can apply for the year-long inclusive training program, which starts in January 2021. The application deadline is October 31, 2020.

Learn more at <http://nrt.ku.edu/>. More NSF grant details are [available here](#).

TORP AND PETROLEUM PROJECTS

- TORP's new [business model](#) under the directorship of **Reza Barati**, C&PE faculty, is focused on outreach/tech-transfer, lab and field services as well as supporting collaborative, multi-disciplinary research
- TORP offered their first online webinar for small operators titled [Effective Temporary Well Abandonment and Reopening](#) back in July. This event was well-received by the operators with more than a 100 attendees
- TORP unveiled [lab and field services](#) to support regional operators
- TORP had a strong presence in the [2020 SPE IOR Conference](#) with a [virtual booth](#), two sessions co-chaired by the TORP director and two well-received papers, supported by TORP services, presented by our post-docs and graduate students: [Sherifa Cudjoe](#), [Qinwen Fu](#) and [Joel Tetteh](#).



PROJECT SAVE ANNOUNCED

Every year, between 2 and 3 million lives are saved because of global immunization practices. However, globally national immunization programs face delivery challenges due to necessary cold chain storage requirements. According to the World Health Organization (WHO), the vaccine cold chain consists of transporting and storing vaccines at the correct temperature (generally 2-8°C) from manufacturing to delivery site. Some of the main problems that limit cold chain performance are: (1) inadequate cold chain capacity, (2) lack of functioning cold chain equipment, and (3)

poor vaccine temperature monitoring and maintenance systems.



**SILICA ADSORBED
VACCINE
ENCAPSULATION**

In low-income and lower-middle income countries only 2% of cold chain equipment is functional with optimal technology. On the other hand, 14% of cold chain equipment is non-functional while 41% is not performing properly. Even when the cold chain equipment is functional, required maintenance is not always provided.

Read the full article @ <https://cpe.ku.edu/project-save-announced>
Or @ <https://shiflettresearch.com/>

MISSION

To eliminate vaccine cold chain reliance in order to minimize waste, reduce costs, and increase immunizations worldwide

OUR TEAM

Dr. Mark Shiflett (KU C&PE)

Dr. David Corbin (KU CEBC)

Dr. Philip Gao (KU SBC)

Dr. Bill Picking (KU Pharm. Chem.)

SPOTLIGHT ON STUDENT SUCCESSES



Next Generation
**SCIENTISTS FOR
Biodiesel**

Congratulations to Leo Budy who was selected as one of four new co-chairs to lead the national Next Generation Scientists for Biodiesel program after. He began to take on more responsibility in the program after spending countless hours in the lab helping with cleaning, organizing, and maintaining the biodiesel production process, and soon received an

Undergraduate Research Award from the university to pursue a research project exploring plant-based adsorbents for the dry washing of biodiesel and biodiesel feedstocks. This research project took place over the course of the 2020 spring semester and has developed into a nascent research paper.

Leo credits the mentorship of his advisor, Dr. Susan Williams, chair of the School of Chemical Engineering, and founder of the KU Biodiesel Initiative and the Kansas Biodiesel Consortium. Under her tutelage he attended biodiesel symposia across the state of Kansas, and then, the 2020 National Biodiesel Conference & Expo in Tampa, Florida, thanks to a grant from the Kansas Soybean Commission. “I had an amazing experience at the conference, to put it mildly,” he says. “The Expo, and especially the Next Generation Scientists for Biodiesel program there, gave me the chance to meet so many influential people in the biodiesel industry, and I just couldn’t believe how lucky I was for the opportunity.”



Leo Body

“It is a sincere privilege to join the co-chairs and to help continue the efforts of the Next Generation Scientists for Biodiesel,” Leo says. “I am thoroughly committed to helping other future biodiesel scientists have the amazing experience that I had at the conference, and to pass on my inspiration to the next generation of students.”



[Pamela Johnson](#), a PhD student in Dr. Robinson's research group, received the HHMI Gilliam Fellowship recently. As a fellow, Pamela will not only receive funding for her research, but the fellowship will further provide DEI funds to host the CPE/BioE Women's Networking Events. Learn more about the fellowship by [clicking here](#).

Pamela was also selected as a ACS CAS Future Leader. On their site, they say, "Pamela is passionate about collaborative research at the intersection of material science and biotechnology. She received her B.S. in chemical engineering from Bucknell University. Pamela is currently a Bioengineering Ph.D. student at the University of Kansas working with Dr. Jenny Robinson on emulsion electrospun tissue scaffolds for the targeted, controlled delivery of hormones. She has been fortunate to receive support for this research through a NIH Pharmaceutical Aspects of Drug Delivery Biotechnology training grant."



A startup firm in the School of Engineering and [Center for Environmentally Beneficial Catalysis](#) leveraged a two-year, \$750,000 Small Business Innovation Research grant from the National Science Foundation to advance technology that can broaden the popularity and ease of owning cars with hydrogen fuel cells, while also making hydrogen production friendlier to the environment. The startup was founded by KU doctoral student **Joe Barforoush** and his

mentor **Kevin Leonard** associate professor of chemical and petroleum engineering (picture above).

“Joe and I developed new materials to produce hydrogen and oxygen from water using electricity,” says Leonard. “Right now, in California and some places in Europe and in Japan, you can buy hydrogen-fuel-cell electric vehicles. Instead of being powered by a battery, they’re powered using hydrogen and a fuel cell.”

The grant will help Avium to build a larger prototype of the DEM water electrolyzer and perform testing at a working hydrogen station. The grant builds on work Barforoush and Leonard performed under a prior NSF award. Under the grant, researchers will make the DEM catalysts and electrodes on an industrial scale. This way the project can be tested in a California station. Five positions at the startup are being supported by the grant and the technology has the potential to boost the Northeast Kansas economy. “This has been great in terms of both the BTBC facilities we have, but also because it enables such close collaboration with KU,” says Leonard. “Both NSF projects, the Phase I and Phase II, are joint projects between Avium and my lab at KU. So, we have the ability to have both a laboratory and an incubator space for a startup company in close proximity to the university. This has potential for some great economic impact.”

Find the original article [here](#).

RECENT PUBLICATIONS

Regis P. Dowd, Yuanchao Li & Trung Van Nguyen. "Controlling the ionic polymer/gas interface property of a PEM fuel cell catalyst layer during membrane electrode assembly fabrication," *Journal of Applied Electrochemistry*, 2020. [Link to Article](#)

Yuanchao Li and Trung Van Nguyen. "High Hydrogen Evolution Reaction (HER) and Hydrogen Oxidation Reaction (HOR) Activity RhxSy Catalyst Synthesized with Na₂S for Hydrogen-Bromine Fuel Cell," *Energies*, 2020. [Link to Article](#)

Find all faculty profiles with links to lab pages @ <http://cpe.ku.edu/faculty>

Wen Shi Lee, Adam K. Wheatley, Stephen J. Kent, [Brandon J. DeKosky](#), "Antibody-dependent Enhancement and SARS-CoV-2 Vaccines and Therapies," *Nature Microbiology*, 2020.

See more DeKosky Lab publications @ <http://www.dekoskylab.org/publications/>

Kumar, A.; Lionetti, D.; Day, V. W.; Blakemore, J. D. "Redox-Inactive Metal Cations Modulate the Reduction Potential of the Uranyl Ion in Macrocyclic Complexes," *J. Am. Chem. Soc.* 2020. ([Abstract](#))

See more CEBC related publications @ <http://cebc.ku.edu/publications>

New Safety Seminar

Reminder about the CPE department will be holding a monthly safety meeting on the 3rd Wednesday of each month from 9 - 10 AM in the Beren Center in Slawson Hall. The first was held on September 16th, and the next one is scheduled for October 21st.

HELPFUL LINKS

Assistance with learning/teaching remotely @ [Remote Learning Resources](#)

Stay up-to-date with all department news @ [CPE News page](#)

Learn about active research programs @ [CPE Research](#)

Commonly needed [Engineering Forms](#)

Find campus-wide events @ [KU Calendar](#)

We hope you are having a safe and productive Fall 2020 semester!

Please remember to follow safety guidelines, wear masks in public, and reach out if you need assistance.



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