Arkansas NSF EPSCoR Newsletter

Year 2, Issue No. 1

The Center for Advanced Surface Engineering

CASE

The Center For Advanced Surface Engineering

Researchers and engineers have recently discovered that when you change the size of a material, the properties often change. Sometimes the color or other optical properties will change, as well as how that material interacts with other substances.

CASE (the Center for Advanced Surface Engineering) researchers are working to understand how we can make new materials and surface coatings by implementing changes at the nano scale. How do we store and share the data from this project with the rest of the world? The cyber infrastructure team is building a solution- a statewide high performance computing cloud that will be connected to Internet2 and numerous other online academic communities.

Can we make surfaces that:

affect or control cell growth?

change physical properties by external stimulus?

are more durable?

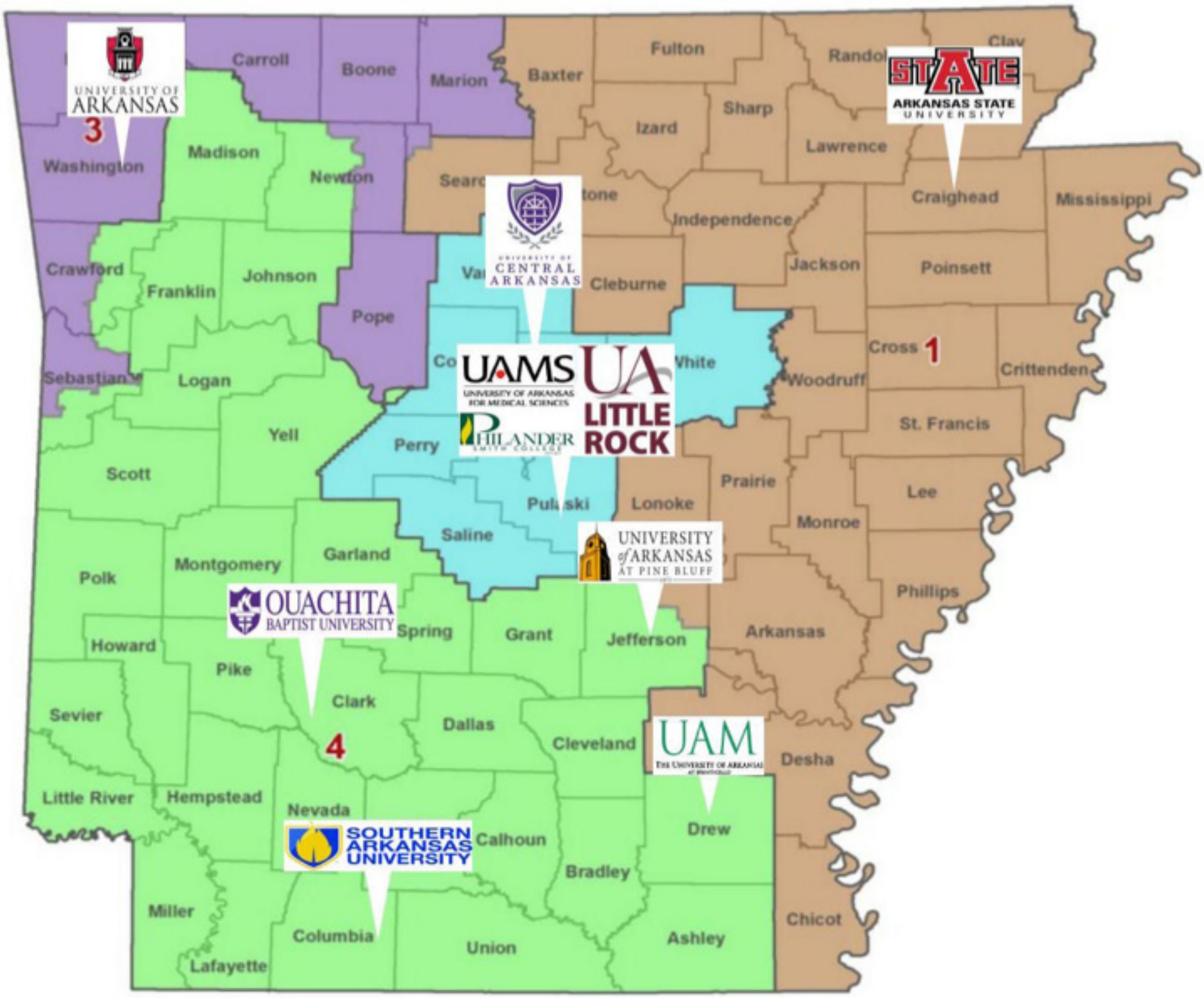
have less friction?

are more sustainable?

have improved abilities?

Visit arkepscor.org for more info about CASE

PARTICIPATING INSTITUTIONS



This map shows the approximate locations of the ten higher education institutions in Arkansas that participate in the EPSCoR Track-1 project, the Center for Advanced Surface Engineering (CASE). The color coding indicates congressional district.

The Center For Advanced Surface Engineering

CASE WELCOMES NEW TEAM MEMBERS

Jocelyn Moore, Philander Smith College

Dr. Jocelyn Moore and student RaQuedra Lee (on left) and student Dustin Ford (on right) working in the lab.

Dr. Jocelyn Moore of Philander Smith College recently joined the CASE project. Her experience with antimicrobial peptides fits in with the research that the CASE Cellulose team is working on. Together they will research effects of antimicrobial cellulose nanoparticles on various plants.

Moore's research could lead to applications in medicine, water quality, plant growth, agriculture, and more. Imagine a more efficient water filter that could easily filter bacteria, or a more sustainable replacement for the numerous antimicrobial plastics used in healthcare.

Dr. Moore is also committed to professional development of her students. She recently discussed this in an interview. "I am just starting out [at PSC] so we are currently getting the lab set up. We will be able to provide undergraduate students with the opportunity to get involved with research, to assist transition to grad school, as well as give experience to students to help them either get jobs or to get into a good graduate program."

PHILANDER SMITH COLLEGE
EST 1877

Pat Desrochers, University of Central Arkansas

From left: Dr. Patrick Desrochers, students Shelby Margis and Triston Clements

Dr. Pat Desrochers is a researcher at the University of Central Arkansas in Conway. He and his students work with ligand systems, molecular tweezers that bind and control the behavior of metal ions. Ligands can be artificially prepared (Desrochers' work) and they also exist in nature, for example as proteins that hold trace metal ions like iron, copper, and zinc in highly specific ways. Examples of these natural ligands are hemoglobin in your blood and myoglobin in muscle tissue.

The particular ligand class that his team studies is called a scorpionate ligand, which received its name because it can bind metals reminiscent of how scorpions grasp and sting their prey, three points of ligand-metal contact. Most recently his lab has been able to anchor these scorpionates to polystyrene plastic, increasing their ability to be reused. But polystyrene is an oil-based polymer and therefore not renewable or environmentally friendly. Desrochers is working with the CASE Cellulose team to experiment with cellulose as a binding substrate for the scorpionate ligand. His lab has shown that cellulose and its soluble cousin, sucrose, can be incorporated into scorpionates and these bind nickel ions in a very controlled manner.

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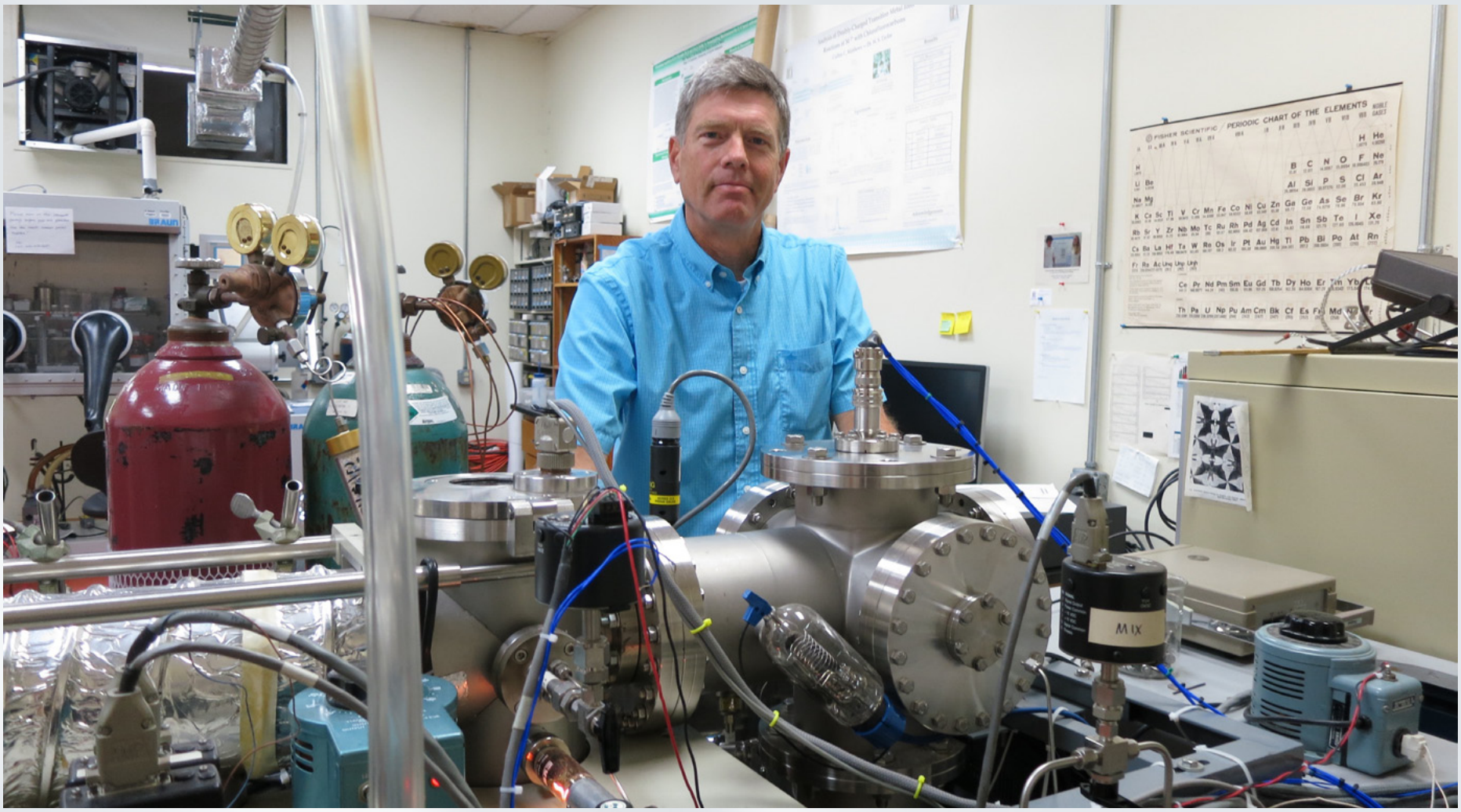
Bill Taylor, University of Central Arkansas



Dr. Bill Taylor at UCA researches the interactions of chemical bonds, ions, and their effect on the environment. He is working in the Tunable research area, and one of his goals is to determine if copper ions can be selectively manipulated to achieve different things. For example, greenhouse gases don't react with normal copper ions, but excited copper ions can break down harmful components.

"For a long time people have been trying to make methane into a reasonable fuel source- it's abundant, renewable, and produced biologically, but it's not a great fuel. Traditional methods pollute the atmosphere and some components stay around without breaking down for decades or hundreds of years."

Dr. Taylor and his students are also working to understand what happens at the molecular level when things interact with copper and other metal surfaces, and how nano-structure can affect the interaction.

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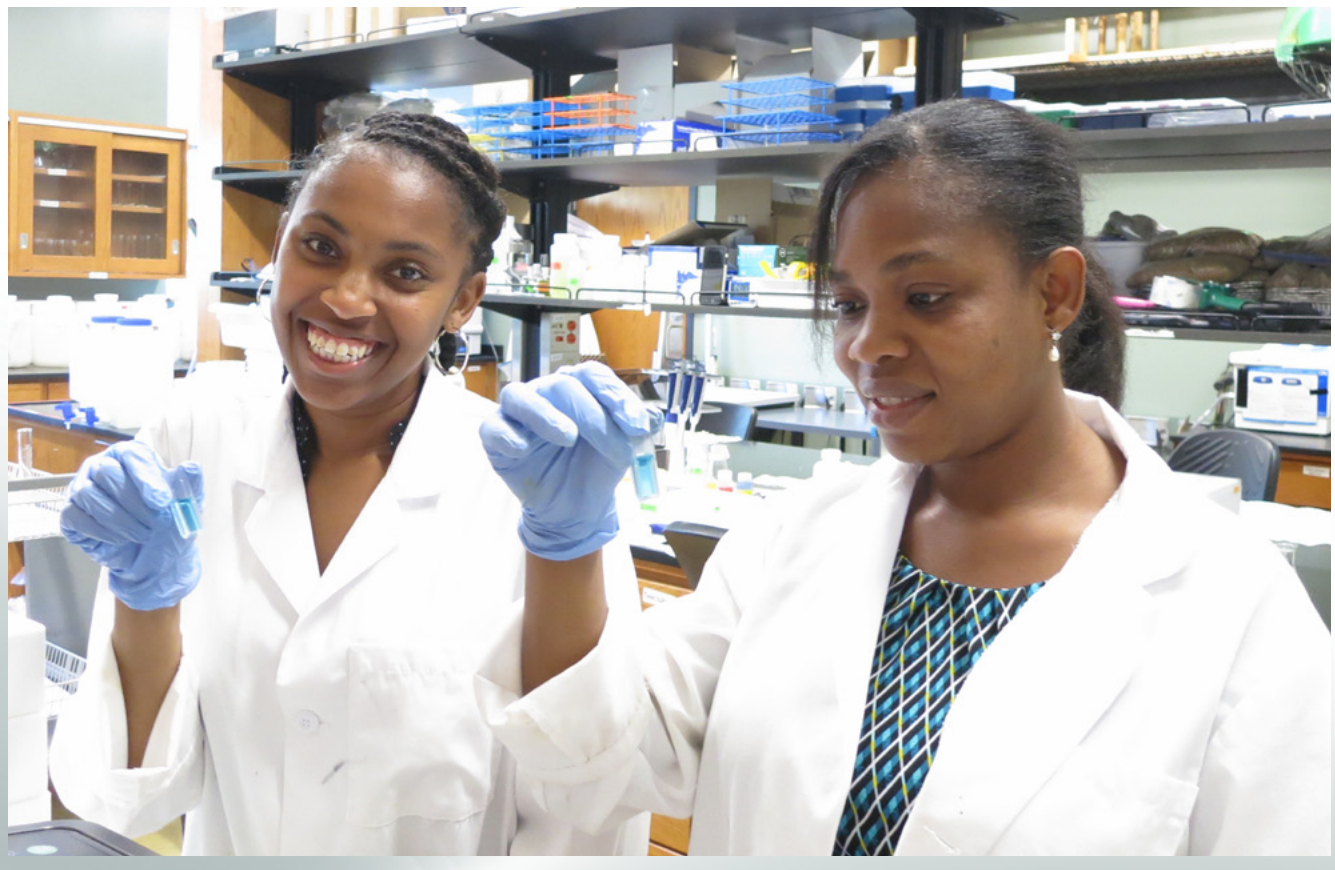
BRIDGING THE DIVIDE : SUMMER PROGRAM

Bridging The Divide is an intensive summer research experience designed for under-represented minority students who are interested in pursuing a STEM graduate degree. The program is managed by Dr. Malathi Srivatsan at Arkansas State University in Jonesboro. The program has supported 23 students via summer research and graduate assistantships since it began in 2015.

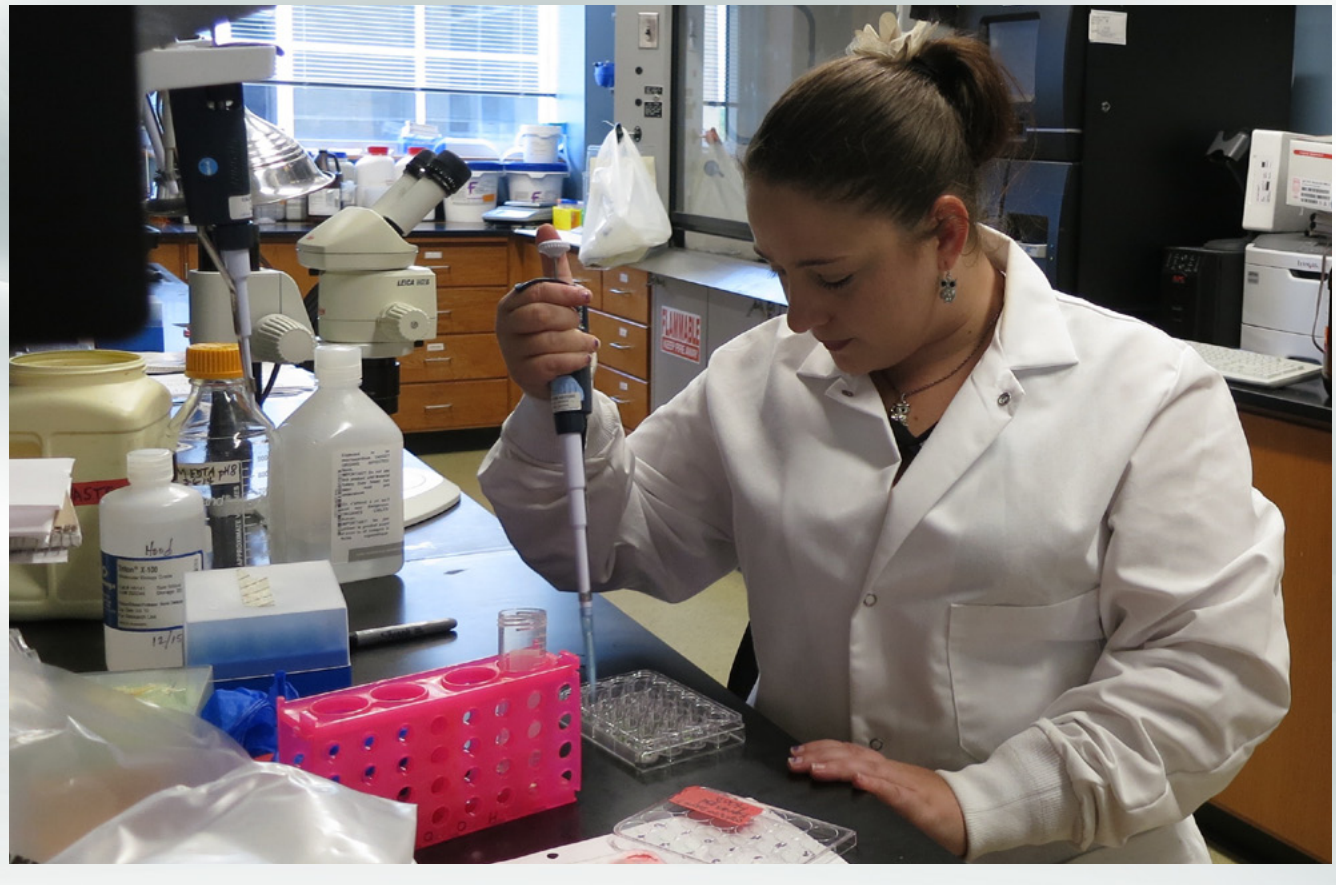
Many graduate programs require or prefer experience in the lab, which can put applicants who are students at non-research institutions at a disadvantage. The students who participate in this program receive in-depth hands-on lab training and complete a project with a mentor, leading up to the group presentation and poster session at the Research Symposium in August every year.

Meet the participants from the 2016 program and learn more about their projects below.



Jacquelynn Pettigrew (left) is a student at the University of Arkansas at Pine Bluff. Her summer project involved monitoring the nutrient runoff at different farming sites to look at pollution as a result of chemical fertilization. Her mentor Dr. Iseyemi (pictured right) showed her how to use a mass spectrometer to compare the different nitrogen types in the water such as nitrite, nitrate, and ammonia.

Kayla Moore (right) is a student at the University of Arkansas at Fort Smith. For her summer project, she used recombinant DNA methods to transfer agrobacterium in corn, with the end goal of determining faster methods to creating transgenic corn for agricultural applications.



Jodie Reithemeyer (above), a student from Arkansas State University, completed a project measuring the effectiveness of different insecticides in rice fields by putting high and low concentrations of insecticide beta-diflucan into insect traps. The experiment helped her determine what species of pests were present in the rice field. She experimented with different concentrations of insecticide to determine the optimal amount to be used for reduction of pests.

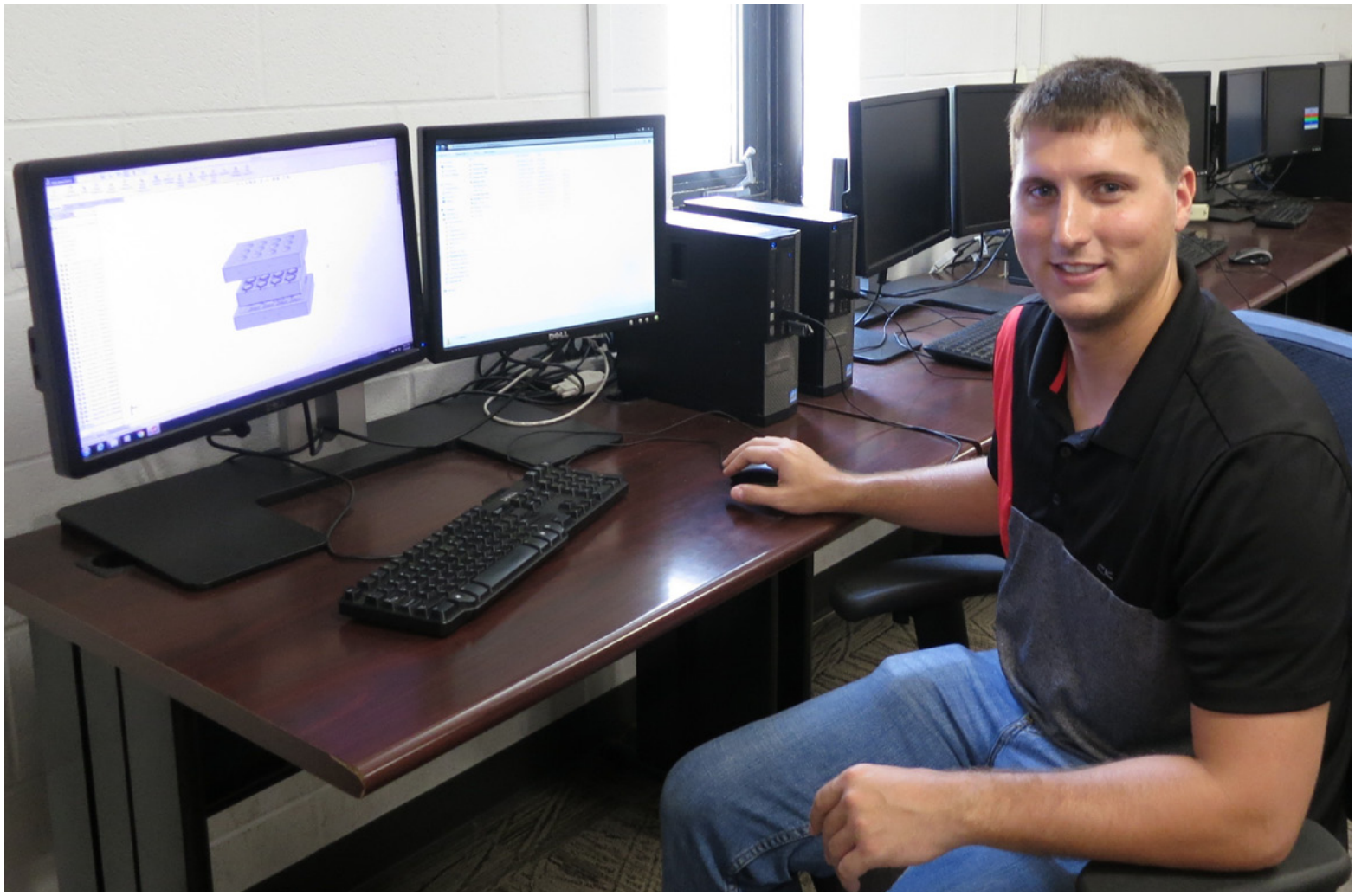
Gideon Long (above) is a student at the University of Arkansas at Fort Smith. He worked with mentor Dr. Argelia Lorence and used the Scanalyzer imaging machine at their facility to analyze corn seeds for optimal growth. He also performed research for Dr. Lorence under the EPSCoR Track-2 project- the Plant Imaging Consortium (PIC).

Reshard Harris (left) is a student at the University of Arkansas at Fort Smith. His project was to determine if modern irrigation methods are more accurate than traditional methods. He experimented with multiple types of irrigation techniques to determine which one is the most cost effective while still providing adequate water to the plants.

Visit our YouTube channel (@arep-scor) for video updates from the Bridging The Divide students.

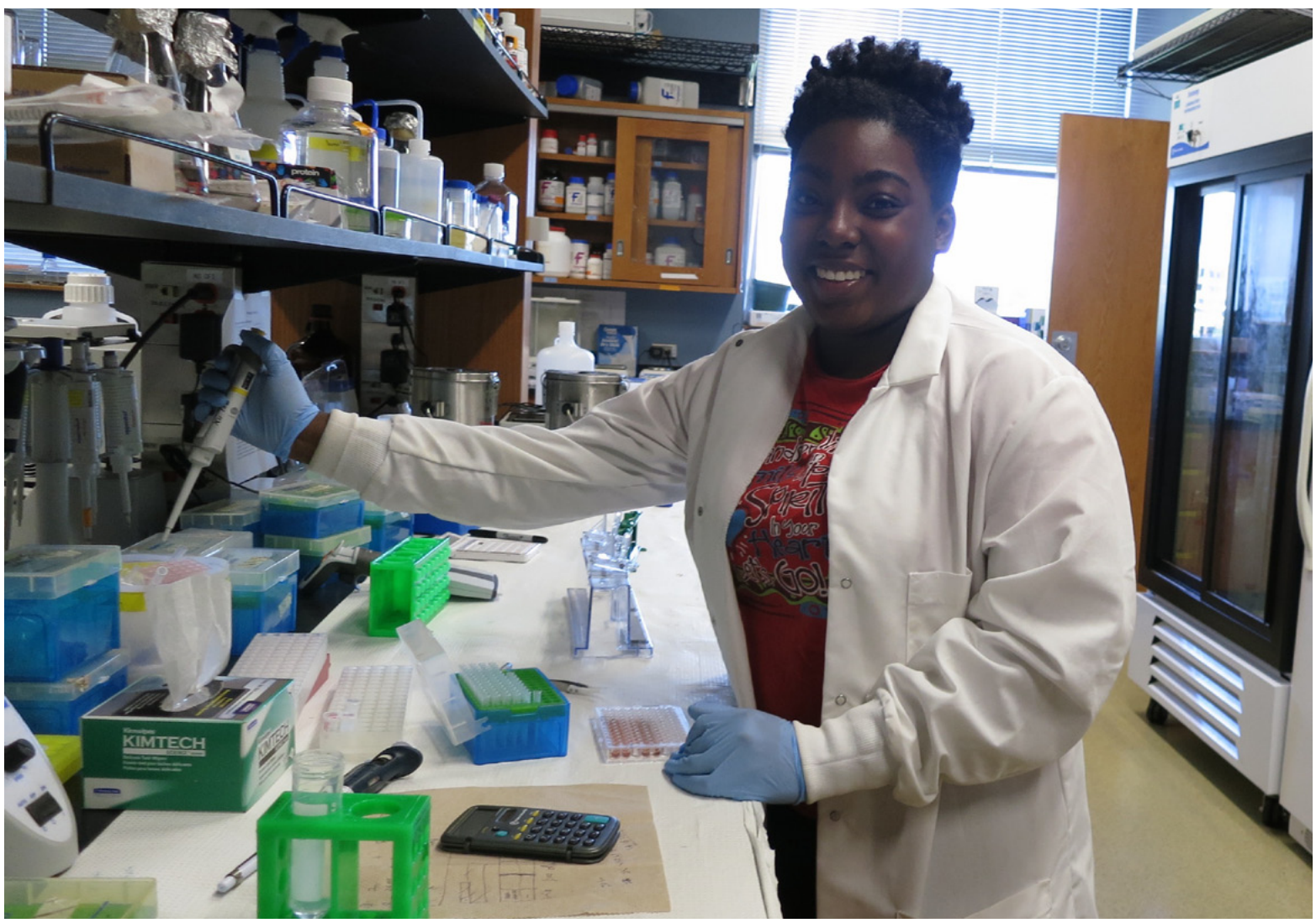
Malachi Miller (below, left) currently attends the University of Arkansas at Pine Bluff. During Bridging the Divide, he researched earthworm preference of soil types for farming applications. Earthworms are essential in the soil in farms because they turn organic materials into nutrients that can be utilized by plants.

Brittany Lognion (below, right) is currently a student at Philander Smith College in Little Rock. Her research involved removing pollutants from water sources, specifically catechol which is commonly found in hand sanitizers. Her goal was to determine the best process for removal of catechol during wastewater treatment. She is still involved with EPSCoR as a student researcher on the Track-1 project (CASE).



Ryan Brumwell (above) is a student at Arkansas State University in the engineering department. His project was to engineer a cell culture system that will electrically stimulate stem cells while in transition to neural cells, which will have applications in the Track-1 CASE project.

Ayliah Coleman (below) attends the University of Arkansas at Pine Bluff. She researched how to utilize sugar compounds from sugar beets and yeast to create biofuel. Since sugar beets are a natural resource in many parts of the world, her research could have global impact.



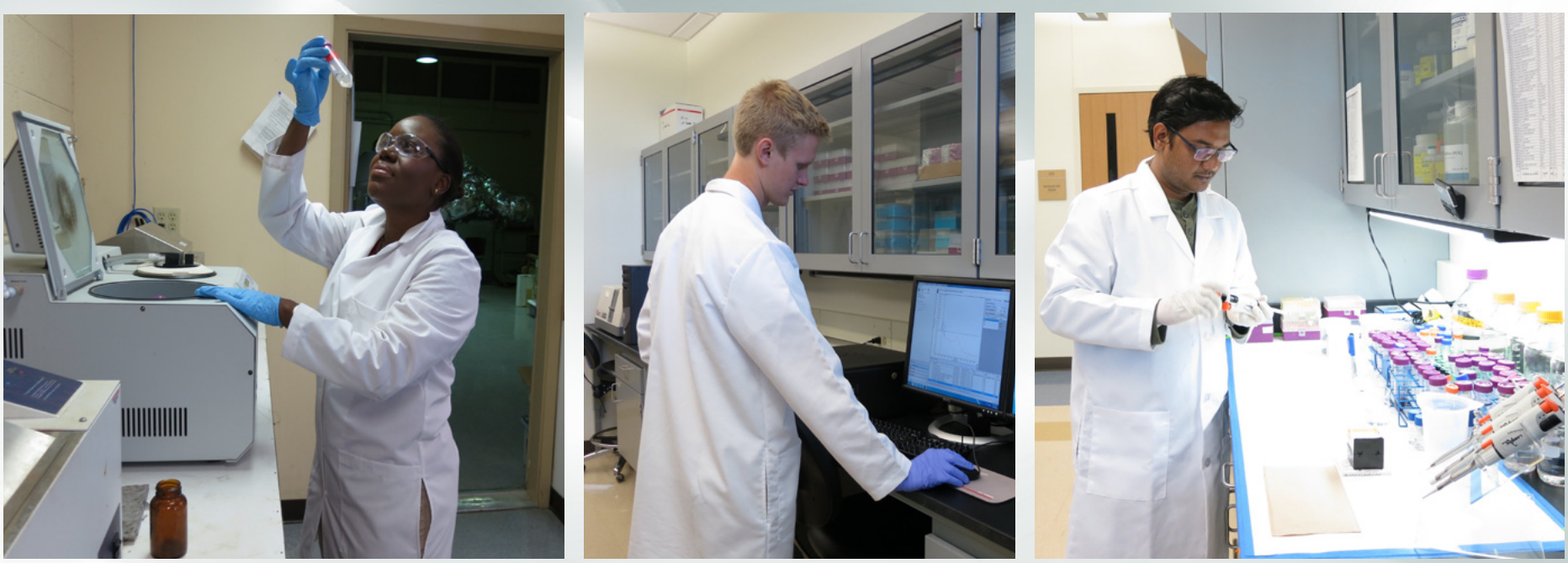
EPSCoR STUDENT RESEARCHERS

Meet some of the undergraduate and graduate level students who are working on surface engineering in Arkansas. These students are working in Dr. Jin-Woo Kim's lab at the University of Arkansas at Fayetteville. They are researching cellulose nano-crystals (CNC) and trying to develop a process to control and functionalize these particles for use in various biomedical applications.

Researching cellulose could have large implications for Arkansas, because our forestry industry produces lots of woody pulp. With the decreased demand for paper goods, it is critical to find other ways to use the pulp.

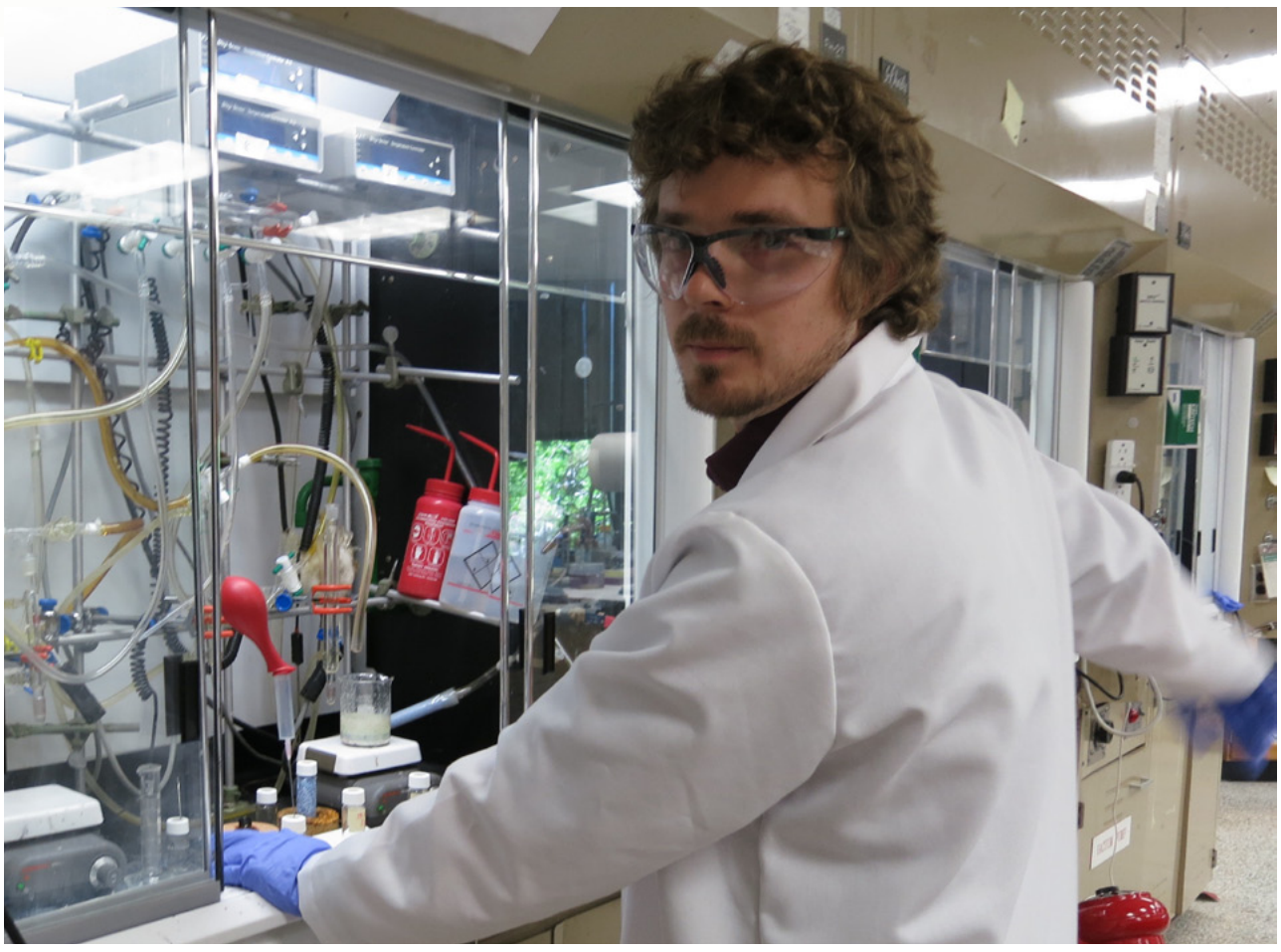
Researchers can develop different structures at nanoscale and create a final surface, which can then be used for different purposes. Dr. Kim describes this process as a 'nano toolbox' where you use particles (tools) that are structured differently to create a final product. This toolbox can be utilized to create final products with desired properties and features.

From left to right: graduate student Amandeep Singh Tusay, graduate student Gurshagan Kandhola, and undergraduate Russell Sharp working in the lab.



From left to right: researcher and Cellulose team program manager Angele Djioleu, graduate student Jake Hockman, and postdoctoral researcher Arvind Sinha.

STUDENT SPOTLIGHT: CAMERON CRANE



Cameron Crane is a graduate student at the University of Arkansas at Fayetteville. Cameron and his mentor Dr. Jingyi Chen have been working together for a few years on various applications of tribology or surface engineering, particularly in biofilms. He is researching how to improve or design biofilms for biological applications, binding capabilities, increased wear resistance and lowered friction for longer use. He also is in the process of commercializing a technology related to polydopamine/PTFE (Teflon) thin films for optimized performance. Cameron and Dr. Chen recently filed a patent for this technology, which is one of four patents filed in the first two years of the project.

EVENTS

MAY 31 - JUNE 3
JUNE 7 - JUNE 10
@ ASMSA in Hot Springs, AR

From Arkansas National Science Foundation EPSCoR &
the Arkansas School for Mathematics, Sciences, & the Arts

SUMMER RESEARCH INSTITUTE

PROFESSIONAL DEVELOPMENT CAMP
FOR UNDERGRADUATE STEM STUDENTS

Some scholarships available for underrepresented minority students. Email JShelton@ArkansasEDC.com

More info & online registration: tinyurl.com/2017-SRI

YOU ARE INVITED!

to the Arkansas NSF EPSCoR

ANNUAL CONFERENCE

JUNE 2 - 3	2017
LITTLE ROCK, AR	

at the Four Points by Sheraton, Little Rock Midtown Hotel

925 S University Ave, Little Rock, AR 72204

REGISTRATION AND MORE INFO: http://tinyurl.com/arkEPSCoR17

The Center For Advanced Surface Engineering

ARKANSAS NSF epscor

ARKANSAS STATE UNIVERSITY
Bridging the Divide
A Program to Broaden Participation in STEM Ph.D.
Undergraduate Masters Ph.D.

SAVE THE DATE!

2017 Plant Imaging Consortium Meeting

June 5-6

@ Hilton St. Louis at the Ballpark,

St. Louis, MO

Events include:

- Student & investigator poster session
- Guest speakers from Iowa State University and the Danforth Center
- Student Professional Development
- Tour of Monsanto Phenotyping Facilities

In Partnership with:

Join the EPSCoR community online!

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