RESEARCH
in the ROCK

Building Cybersecurity Leaders

Dr. Mengjun Xie prepares students for real-world attacks

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ORSP Mission Statement
ORSP provides information, services, and support to members of the UA Little Rock community to enable them to compete successfully for outside funding to conduct scientific research; create works of art; compose music; write books and articles; improve their performance in the classroom; and better serve their students, professions, and the public.

Contents

Letter from the Interim Vice Provost
for Research and Dean of the Graduate School

As I complete my first full year as the Interim Vice Provost for Research and Dean of the Graduate School, I am inspired by the exceptional research and creative activities occurring on our campus. Observing the unique and ambitious scholarly activity from the arts, humanities, social sciences, physical and the natural sciences, engineering, education, and information technology disciplines has given me great hope for the future of our institution and its impact on the region. As I embark on my second year in this position, I remain committed to my objective to maintain a vibrant research and creative activity enterprise that is open to active collaborations and learning opportunities.

With Chancellor Andrew Rogerson's leadership, UA Little Rock is entering a new era with fresh ideas, collaborations, and opportunities that will enhance research and creativity across the institution. Because of former Chancellor Joel Anderson's commitment to leadership, UA Little Rock has established itself as one of the premiere research institutions in the state. Under his leadership, UA Little Rock established the Emerging Analytics Center, the Center for Integrative Nanotechnology Sciences, and the TechLaunch program that helps faculty researchers commercialize their research. In this new era, we can take this foundation and create even more avenues that allow faculty and students to engage in scholarly activity that positively impacts the community and the world.

In April, I attended the UA Little Rock Student Research and Creative Works Expo, an event that allows student researchers to showcase their research and creative projects to the campus community. I was pleased to see the enthusiasm, innovation, and passion each student presented at this expo. UA Little Rock strives to engage students in an active learning environment to employ skills that will help them ask new questions, discover new solutions to problems, and work collaboratively to achieve their goals. This expo is one avenue for achieving that mission. I was especially delighted that the Research and Creative Works Committee led the effort to pilot several "exploratory presentations," such as a digital humanities hub and a concrete canoe display, in preparation for a more diverse and expanded expo format for future years.

As we move forward as an institution, let us continue to pursue innovative research opportunities and collaborations while engaging students to propel them into the future.

Dr. Abhijit Bhattacharyya
Interim Vice Provost for Research and Dean of the Graduate School

Letter from the Director of the
Office of Research and Sponsored Programs

Each year, the faculty of UA Little Rock continues to impress me with its innovative ideas, cutting-edge research, and creative works. At ORSP, we strive to help faculty with the grant submission and award administration process. That way, they can focus on the most important aspects of their projects and research. We have worked with faculty members who have submitted a variety of projects, such as cancer research, renewable energy, social media behavior modeling, and cybersecurity learning platforms.

We are also proud to work with faculty and staff who establish programs that impact the community. UA Little Rock provides a variety of programs that assist citizens from all backgrounds in central Arkansas, including disadvantaged students, children with disabilities, and retired citizens looking to expand their educational horizons.

Another part of our mission is to create networking and collaboration opportunities for researchers. On March 30, 2017, we held the Research Colloquium in Ottenheimer Library. Led by Drs. Nitin Agarwal and Eric Wiebelhaus-Brahm, this event allowed participants to learn about the challenges, joys, and opportunities for interdisciplinary research. Sharing experiences and learning the ins and outs of the grant funding process plays a crucial role in creating a successful grant. Researchers and creators, especially those who are new to the grant funding process, should not have to struggle on their own. We hope to create more opportunities in the future to help UA Little Rock faculty advance their research initiatives and creative projects.

As our institution evolves with a new administration, I look forward to the new ideas and programs that will expand our research opportunities and creative endeavors. We have come a long way thanks to the wonderful leadership of former Chancellor Joel Anderson, and I am excited to see how Chancellor Andrew Rogerson will guide UA Little Rock into becoming an even more prestigious research institution.

Tammie Cash

Tammie Cash
Director of the Office of Research and Sponsored Programs
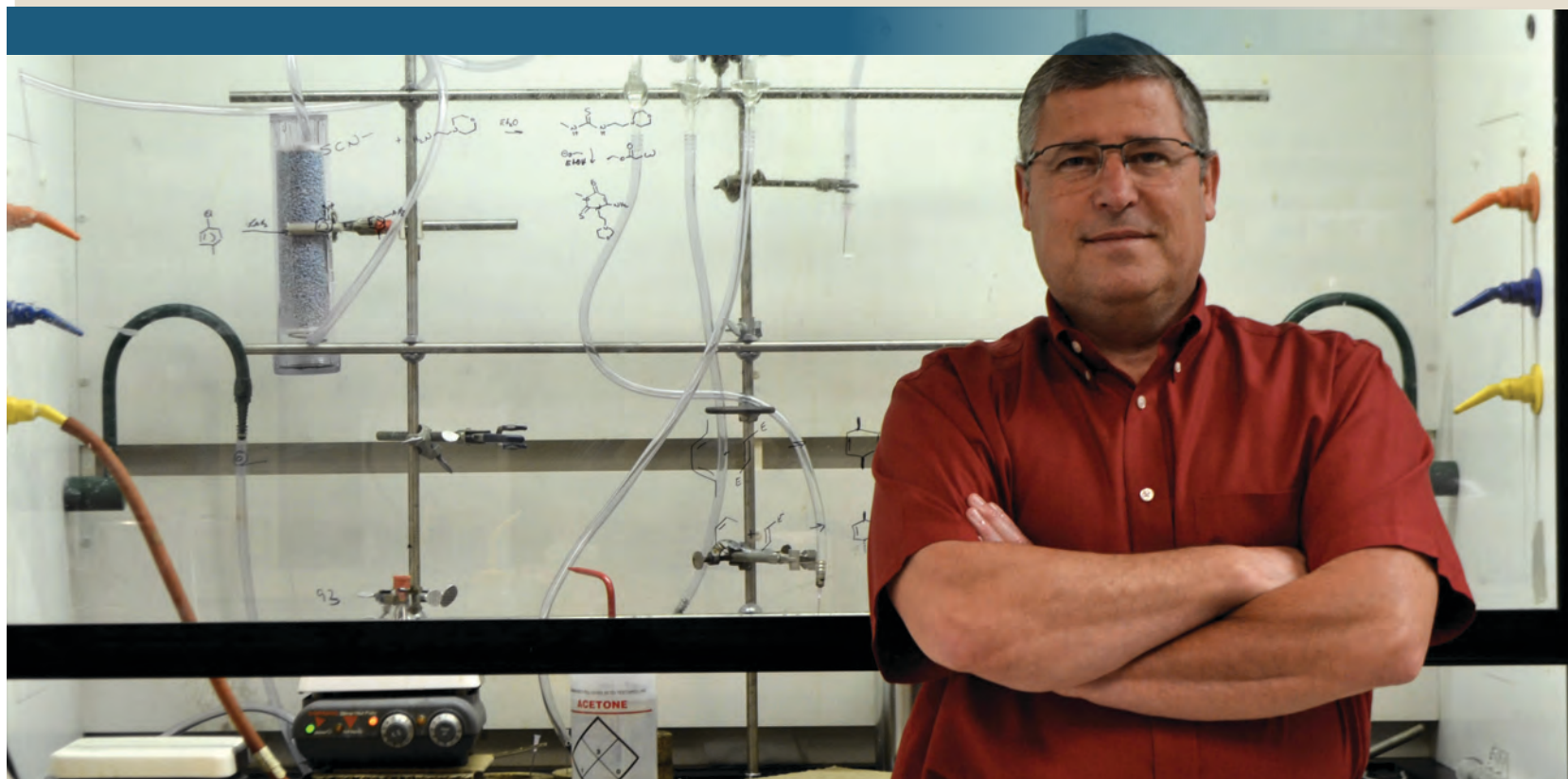
Enhancing Cancer Therapy

Dr. Darin Jones works with Dr. John Tainer at MD Anderson Cancer Center to Make Cancer Treatment More Effective and Efficient

Cancer therapy has greatly progressed over the years as doctors and scientists have discovered new avenues for treatment and diagnosis. However, many strides still need to be made to completely eradicate this deadly disease. The National Cancer Institute says that cancer is one of the leading causes of death in the world. In 2012, 8.2 million people worldwide died from cancer.

Thanks to the ongoing research of Dr. Darin Jones from the UA Little Rock Department of Chemistry and Dr. John Tainer from the MD Anderson Cancer Center at the University of Texas, cancer treatment can one day be more effective at specifically targeting tumors. Dr. Jones has been awarded $795,683 over five years for the project.

The Basics of Cancer Treatment

In traditional cancer therapy, doctors can use chemotherapy, a process in which specialized drugs are used to target and destroy cancer cells in the body, and/or hormonal therapy, in which specialized drugs target hormonal receptors that already exist in the body. These receptors are proteins found in cells that acquire and process signals from hormones such as estrogen and progesterone. In turn, these receptors tell the cells how they should grow. If estrogen-prone receptors tell cancer cells to grow, then doctors target these receptors that stop this particular signal.

"A lot of cancers are treated based on the phenotype of the cancer, based on whether there is a receptor present or not," explains Dr. Jones. "If a certain type of

receptor is present, they get one type of treatment. If a different type of receptor is present, they get a different type of treatment."

If a patient does not have a pre-existing receptor in their body, however, the chance of survival is very low. But with Drs. Jones and Tainer's research, patients who do not have pre-existing receptors will have a better chance of survival.

"This idea is borne out of the fact that you wouldn't have to have a receptor to receive treatment," explains Dr. Jones.

The Hard Science

The process involves an enzyme (a chemical molecule that accelerates chemical reactions) called poly(ADP-ribose) polymerase 1, also called PARP1. Chemotherapy and hormonal therapies activate DNA damage, which in turn activates the PARP1 enzyme.

PARP1 then generates poly(ADP-ribose), a protein that can either initiate DNA repair or initiate cell death using receptors. The idea is to prevent DNA repair from occurring, since the DNA damage eventually kills the cancerous tumor.

"If you get a hyperactive buildup of poly (ADP-ribose), then you get cell death. If it's a tumor cell, then you want it to die. Once you get the buildup of this, we prevent the enzyme that causes the turnover of the poly (ADP-ribose). By preventing the turnover, it facilitates cell death...more importantly, to kill a tumor you don't need a receptor."

Drs. Jones and Tainer are creating a type of cancer therapy that will specifically target tumors by only initiating cell death. By creating this process, a patient does not have to rely on receptors in order to receive treatment, which in turn can save more lives.

This type of treatment will also allow the patient to receive a lower dosage of chemotherapy, which can have numerous side effects.

"In an idealized world, you would treat a person with a much lower dose of the toxic chemotherapy agent,

> **"In an idealized world, you would treat a person with a much lower dose of the toxic chemotherapy agent, then treat them with this therapy, and then it would kill the tumor. That's the whole idea."**

then treat them with this therapy, and then it would kill the tumor. That's the whole idea."

Because the treatment requires DNA damage, chemotherapy would still be the main procedure to administer this type of therapy. However, for cancer patients who already have genes that do not allow DNA repair mechanisms, this treatment could be successful without the need for chemotherapy.

Dr. Jones focuses on creating the medicine for the project, while Dr. Tainer focuses on testing the medicine. "Without a doubt, the creative chemistry from Dr. Jones is the heart of the project and what is driving its success" Dr. Tainer remarks.

Expert in Cancer Research

Dr. Jones has already received attention for his extensive cancer research. In 2014, he received $50,000 from the Arkansas Science & Technology Authority for researching a molecule found in Ecuadorian plants that could aid in leukemia treatment.

Before Dr. Jones joined the Department of Chemistry at UA Little Rock, he worked in multiple capacities at the university and corporate level. He was the senior principal scientist and research scientist at Pfizer, a prominent pharmaceutical company. He was also a senior scientist in the Department of Biochemistry and Molecular Biophysics at Washington University School of Medicine.

Fast Track to Commercial Success

Arkansas Small Business and Technology Development Center Helps Small Technology Startups Turn Their Passions into Successful Businesses

Starting a business can be an exciting moment that allows someone to turn their passions, ideas, or inventions into a company. It can also be a daunting task. Entrepreneurs have to think about not only products and services but also all of the details of running a business, such as creating business plans, conducting market research, advertising, and budgeting.

Thanks to the UA Little Rock Arkansas Small Business and Technology Development Center, entrepreneurs around the state have access to a wealth of information and services that can help them succeed and bring new research with commercial potential to market.

Funded by UA Little Rock and the U.S. Small Business Administration (SBA), the Center is a statewide network with seven offices. The network allows The Center to assist entrepreneurs around the state including rural areas.

The Center works with all types of for-profit businesses and is specially accredited to assist technology-based ventures.

FAST Program for Research and Development
The Center was one of five in the nation selected by SBA to receive a $200,000 grant to support programs for innovative, technology-driven small businesses in 2016-17. The Center has received funding for seven consecutive years from the SBA's Federal and State Technology (FAST) Partnership Program to target services to businesses that focus on technology development and innovation.

The Center's FAST program is designed to assist clients who want to receive Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) funding. The highly competitive grants and contracts support federal research and development projects that have commercial potential.

Located in the College of Business on the UA Little Rock campus, The Center offers extensive mentoring and training services that allow clients to receive one-on-one assistance and guidance. In the first six months of the current FAST project, 87 technology clients have utilized The Center's mentoring services.

Laura Fine, state director of The Center, describes how the organization and the FAST program are important components of the Arkansas economy:

"Congress created our organization to help create jobs. That's really what we're doing. So while we do have to try to make sure that we're serving everyone, we are focusing our services as much as we can on those businesses that we think are going to be able to generate more jobs for Arkansas. And when you're talking about technology companies and the knowledge-based industry, those are higher paying jobs for Arkansas, which is a goal of this state."

Workshops and Training Seminars

The Center hosts a number of training sessions and workshops for innovation and technology clients. Since 2010, about 1,800 attendees have participated in The Center's training sessions that include introductory SBIR/STTR seminars, technology roadmapping, proposal writing workshops, and live webinar presentations with guest speakers from federal agencies.

Martial Trigeaud, business consultant for the Center, conducts various workshops to help technology-based entrepreneurs in Arkansas turn their ideas into businesses. One of these workshops is a "Lean Canvas" series that helps business owners define their business' goals and objectives to help them see their customer base, key resources, partners, and projected revenue and profit.

Rebecca Norman, who is the Center's innovation consultant, has been with The Center since 2009 and guides clients through the process of exploring the SBIR and STTR programs. With a background in science and technical writing, Rebecca teaches the detailed ins and outs of writing a successful proposal.

Helping Businesses Learn About People

The Center also provides extensive market research services for small businesses and startups in the state. In basic terms, market research is essentially learning about customers, competitors, and behaviors. Market research answers the fundamental questions that entrepreneurs ask when starting a business, such as, "Are people interested in my product or service?" "Does anyone else provide this product or service?" and "What's the best location to place my business?"

Success Story

The Center has proven its value to the Arkansas economy over the years. One example of The Center's FAST program success is Synanomet, LLC, which is commercializing its unique process for purifying contaminated waters using nanomaterials.

Led by Chief Scientific Officer Dr. Tito Viswanathan, who is also a UA Little Rock chemistry professor, Synanomet utilized The Center's market research services and SBIR proposal writing training. With the center's help, Synanomet won $300,000 in Phase II funding from the U.S. Environmental Protection Agency, one of only seven out of the original 25 proposals to get Phase II funding.

For more information on the Arkansas Small Business and Technology Development Center, visit **asbtdc.org**.

The Arkansas Small Business and Technology Development Center is funded in part through a cooperative agreement with the U.S. Small Business Administration through a partnership with the University of Arkansas at Little Rock College of Business and other institutions of higher education.

Spotlight on Student Researchers: Nigel Kelly

Nigel Kelly is an undergraduate researcher in the Systems Engineering program at UA Little Rock and works at the Center for Integrative Nanotechnology Sciences. With a background in the US Navy, Nigel works with Dr. Ganesh Kannarpady to research how nanomaterials can repel water and oil and be used in anti-icing applications.

What brought you to UA Little Rock?

After high school, I was active duty in the Navy for six years. After I left, I worked briefly in Little Rock. I realized I wanted to do something different with my life, so I enrolled in what I think is the most challenging program at UA Little Rock, Systems Engineering. I was really interested in the Center for Integrative Nanotechnology Sciences, so I applied to be a student researcher in their department.

Could you tell me about your work with the Center for Integrative Nanotechnology Sciences?

I work with surfaces on a very small scale that repel water, oil, or both. These surfaces have a lot of applications—for example, oil cleanup. In that application, crews can use a surface that can suck in oil and repel water. I also work heavily in anti-icing applications. For example, helicopter pilots in the Arctic Circle have a big problem of ice accumulating on their blades, and we're working on a solution for that kind of issue.

What interests you about this research?

It's cool and really fun! I gain a lot of experience on equipment like the scanning electron microscope and the atomic force microscope, which I am now qualified to use. I'm fascinated by looking at objects on a really tiny scale, and I'm really excited to have that opportunity.

Have any faculty members been especially beneficial during your time at UA Little Rock?

I would say my supervisor, Dr. Ganesh Kannarpady, has been very beneficial during my time here. He's a very positive person who has been a great influence to me. He's very open and helpful. If I ever need anything, I just ask him.

I am also very grateful to Dr. Alexandru Biris for extending the opportunity for me to work in the Center. He is very supportive of student involvement in the Center's research, and I am glad to be a part of the program.

What do you plan to do with this research after school?

I'm open to different possibilities.

Preserving a Species

Dr. William Baltosser Works with a Team of Other Researchers to Bolster Preservation Efforts of Diana Fritillary and Great Spangled Fritillary Butterflies

Dr. William Baltosser, Professor of Biology at UA Little Rock, has spent several years investigating the natural habitat of Diana Fritillary and Great Spangled Fritillary butterflies along the Jordan Road Track of the Terre Noire Natural Area in southwest Arkansas. Terre Noire is a 700-acre blackland prairie preserve that houses over 400 different species of plants and wildflowers. In 2016, Dr. Baltosser received $7,434 from the Arkansas Natural Heritage Commission to continue this project.

With the help of the Arkansas Natural Heritage Commission, the U.S. Forest Service, The Nature Conservatory, and the Arkansas Game & Fish Commission, this project began as an effort to document the distribution of the Diana Fritillary (butterfly on AR license plates) throughout Arkansas. Subsequent investigations have been aimed at characterizing the habitat requirements of the Diana and that of the closely related Great Spangled Fritillary, which has served to further clarify habitat requirements of the Diana.

According to the Arkansas Game & Fish Commission and the Arkansas Natural Heritage Commission, the Diana Fritillary is a species of concern (AR Wildlife Action Plan). To combat the loss of this species, it is imperative to protect, preserve, and to create quality habitat throughout the range of this species. Various state and federal agencies, along with private

> **"When people started putting out all fires," Dr. Baltosser explains, "that created all sorts of problems."**

groups, are working to accomplish this goal through a variety of management initiatives.

Creating a Mosaic of Different Habitats
Blackland prairies are natural, untampered habitats with rich, dark soil. These habitats occur throughout Texas, Arkansas, Louisiana, Alabama, and Mississippi. According to the Arkansas Natural Heritage Commission, this type of ecosystem historically spanned 321,000 acres in Arkansas. In 1989, only 14,826 acres were classified as untampered land. This reduction is due to factors such as agriculture, forestry, urbanization, and mining.

Dr. Baltosser has witnessed the effects of land conversion on a massive scale from one habitat to another. One of the biggest contributors has been the suppression of naturally occurring wildfires. Since wildfires help to maintain the habitat of the Diana Fritillary and Great Spangled Fritillary, much of their former habitat has been lost. This is reflected in fewer numbers, diminished range, and a more precarious existence for these butterflies.

"When people started putting out all fires," Dr. Baltosser explains, "that created all sorts of problems. Smokey the Bear enforcement was not necessarily good for a great many habitats."

Wildfires are important to Diana and Great Spangled Fritillaries because these species forage in an ecotone environment, a transitional area between open prairie and closed forested areas. If the environment is all prairie or the forest too dense, these species of butterflies will
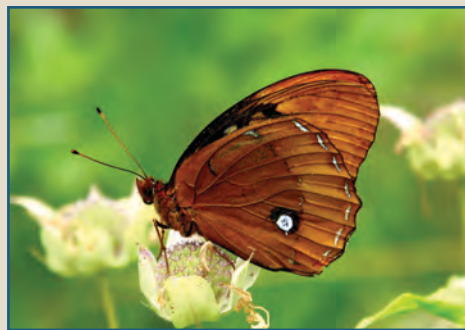
not thrive. It is important to maintain a balance between open forest and prairie to produce the quality habitat required, particularly by the Diana.

Dr. Baltosser explains that you have to look beyond a specific plot of land and think about the importance of creating a mosaic of different habitats. This unique mosaic creates a healthy environment for the Diana Fritillary and Great Spangled Fritillary species.

The team on this project wanted to improve the natural habitat for the butterfly species and supported introducing fire back into the area through controlled burning. This technique not only created more ecotone areas, but it also allowed more wildflowers that adult butterflies forage on to appear.

Historically, a fire would naturally occur every three to four years in many sites, which allowed for new growth within an area. Once the fire ceased, landowners could maintain the land according to how the area was burned. Because regular burning was stopped, trees and shrubs would overtake the area

and limit the ecosystem that allowed the butterfly species to thrive. Within the context of the newly funded study, numerous trees were mechanically removed to "set the stage" for controlled burning.

One of the primary objectives of this phase of investigations deals with the impact of loss of canopy cover on the larval food plants (violets) of fritillaries. Dr. Baltosser explains, "When you take the trees out, you remove the canopy cover. That increases the light which, in some cases, might be good for plants, but it also increases the desiccating effect of the sun. "We will be studying the extent to which this impacts fritillaries, as violets are essential for larval development and thus fritillary survival.

Allowing New Growth
Dr. Baltosser believes this project is a perfect opportunity to see how the butterfly species will react when overgrown areas are reclaimed. Now that they have reshaped the land and made it suitable for controlled burning, the research team has expanded the scope of the study to monitor the occurrence and survival of violets in the altered sites. He and project partners have acquired data on important nectar sources in late spring and late summer using GPS mapping and conducted surveys of both species of butterfly annually since 2010. They will use this research, and their familiarity with the area, as the basis for comparison in this current project.

Spotlight on Student Researchers: Hunter Wayland

Hunter Wayland is a graduate student studying chemistry who was chosen as a fellow in the National Science Foundation's Graduate Fellowship Program, a highly competitive program that supports outstanding student researchers.

What brought you to UA Little Rock?

I had a couple of options when it came to grad school, but decided to come to UA Little Rock because I'm from Arkadelphia so it's close to my family. I was also interested in some research projects on environmental chemistry being done in the department, so it was a good fit.

Can you tell me about your work with the Research Fellowship Program?

When I started, my research proposal was based on detection and degradation of water pollutants. The global water crisis is a pretty big issue. Our water patterns are redistributing where we're getting droughts in certain areas, and monsoons in traditionally dry areas. Secondly, the quality of our drinking water on a global scale is decreasing, yet our world population keeps growing.

The area of research that I worked on initially pertains to making clean water widely available at a low cost in underdeveloped countries. The compounds we used in that project can be applied for other purposes as well. We can use catalysts (substances that increase the rate of chemical reactions) to facilitate the degradation of some water pollutants that are otherwise difficult to remove. Those same catalysts can promote a valuable reaction that be used for fuel cells as well. So now my research has focused on fuel cell development for cleaner energy alternatives.

My original proposal was based on detection of different anthropogenic (human-caused) compounds in crops. Our water situation has gotten bad, even in the United States. California, for instance, is using wastewater from municipal sources to irrigate crops, which is a great idea fundamentally. However, we're putting all sorts of stuff in the municipal water supply, and a lot of it can end up in your food if wastewater irrigation isn't carefully engineered.

For urban watersheds, we introduce tons of chemicals, including medications and metabolites from things we drink, even coffee. Those products get released via human waste and re-enter the water supply. Some of that stuff, like anti-seizure medication carbamazepine, can actually end up in the crops if wastewater is used to water them. My original proposal was to develop a detection method for tracing those anthropogenic pollutants through the water sources into the crops. When I came to UA Little Rock, Dr. Anindya Ghosh introduced me to the idea of using catalytic systems for detection and degradation of pollutants, so that's where I started.

What do you like the most about mentoring students?

It's hard to watch them struggle sometimes, but it's very rewarding when a concept finally clicks. As a mentor, you have to let them figure things out for themselves (within reason), and it's a little painful to watch sometimes because some things seem simple from a mentor standpoint, but I remember when I was an undergraduate and struggled in the lab, too. But the most rewarding part is seeing them light up when they finally understand a concept they've arrived at themselves.

What have you learned the most about the research field?

You have to learn how to be patient when you come to grad school. I did undergraduate research for three years, so I was familiar with the process. As an undergraduate, however, research isn't such a crucial part of your career. You're still a career student at that point. Your success is measured in terms of GPA and extracurricular activities to get you ready for your career. In graduate school, however, research is your career. To get research funding, you have to have results, but you need funding to start doing research, so it can be a vicious cycle. Also, research goes off into a different direction sometimes. You feel like you're making progress and getting solid results, but really, it's taking you down a different path and you have to learn how to gracefully roll with the punches. It's easy to get hung up, but you have to be patient with research.

What are your future plans?

I will finish my Master's of Science in May 2018, and I'm looking at a couple of different options for after that.

Assembling the Future

Dr. Brian Berry Uses Expertise in Self-Assembly to Find Solutions to Real-World Problems

Being a researcher can almost be seen as a natural calling—a vocation that compels you to seek new solutions to life's problems. Dr. Brian Berry, Chair of the Department of Chemistry at UA Little Rock, is driven to use his research and academic background to not only prepare students for their future, but to seek new solutions to create alternative energy sources, enhance water filtration systems, and discover new ways to create computer storage media.

"I think that's why we all come to academia," Dr. Berry explains, "because we don't want to get stuck doing the same thing over and over again. We always want to look for something new."

Dr. Berry has taught at UA Little Rock since 2008. As a student of the institution, he graduated with a Bachelor of Arts in Chemistry in 1999 and a PhD in Applied Science and Chemistry in 2004. In 2014, he won the UA Little Rock Faculty Excellence Award. Year after year, students give glowing reviews for his teaching style.

During his time as a chemistry professor, Dr. Berry has been involved in numerous research projects. Each new project has sparked inspiration for new ideas and solutions to problems.

Adventures in Self-Assembly

Dr. Berry's expertise is in the self-assembly of polymers (tiny molecular structures that form plastics like Styrofoam®). In particular, he works with block copolymers which are made from two different polymers with very different properties that are joined together. The resulting molecule can form a variety of shapes that are joined together. These shapes are often many times smaller than the width of a human hair.

Because these polymers have different properties and do not naturally associate themselves with one another, the process of forcibly linking them together will frustrate them, which in turn will create new block copolymer structures. In the classroom, he often describes this process as two people handcuffed to one another who don't like each other. They're forcibly linked to each other, and because they don't want to interact, they will turn their backs and minimize their contact with one another. This frustration leads to the formation of a wide variety of nanostructures.

"I like the idea of being able to control self-assembly," reflects Dr. Berry. "It's almost like being able to create something that then creates itself."

Turning Up the Heat

Dr. Berry is using his expertise in self-assembly to create new materials with limited defects, which is a common occurrence with self-assembly.

"The problem with all self-assembly is that scientists aren't as good as nature," Dr. Berry explains. "Nature can self-assemble things and hardly ever make a mistake. And if it does make a mistake, it has built-in mechanisms to fix it. But scientists aren't smart enough yet to be able to do that."

When structures are self-assembled in the lab, sometimes certain molecules may not line up right. This is problematic for the computer industry that can use these structures to create high density hard drives and faster computer chips. With these applications, however, accuracy is essential.

Dr. Berry wants to find a way to limit defects in these structures so they can actually be useful. He is working with Dr. Alamgir Karim from Akron University on a process to reduce defects in the self-assembly process. Together they have been awarded grants totaling nearly $950,000 from the National Science Foundation over the past seven years to address these issues.

They were inspired by the annealing process, which is commonly used in metal, glass work, and even chocolate making. In this process, glass or metal makers take their material and process it through intense heat in specific areas. Once it has been exposed to these high temperatures, the material is then able to sit and slowly cool. Dr. Berry and Dr. Karim use this process to manipulate thin sheets of film made from block copolymers. Instead of heating all areas of the thin film at the same time, they can expose it to heat in specific areas or zones, which reduces defects.

Harvesting the Power of the Sun
In 2016, Dr. Berry won UA Little Rock Research Cluster Seed Grant with Drs. Tito Viswanathan, Nawab Ali, and Allan Thomas. This project investigates how "doped" nanocarbons could solve food, energy, and water problems. Working on this project aligned with his desire to investigate how, just like plants, sunlight could be turned into fuel using fullerenes, molecular cages made from carbon alone.

This project, along with others in his lab focus on harnessing the power of the sun. In a previously funded project, he self-assembled fullerene molecules in an attempt to create more efficient, flexible organic solar cells that are lightweight and that can be rolled up. Over time he has become intrigued by the idea of combining the principles from these solar cells with other novel materials created in his lab to allow "synthetic" photosynthesis, a process that could produce storable fuels from harmful air pollutants using the sun.

"Imagine if you just sat something outside in your yard, and it collects carbon dioxide in the air and converts it into some kind of fuel that you could use to energize your house. This is the big dream."

Dr. Berry calls this specific project his "pet project." It's still in its early stages, but he's excited to see if this project can be taken to new heights.

Solar Future
Dr. Berry understands that solar is just one piece of the pie when it comes to alternative energy sources. Solar will have to contribute with other energy sources to accommodate our needs.

"Alternative energy is really important to be able to make us self-sufficient. The best way to ensure that we can be self-sufficient and that our economy prospers is to work on these alternative energy sources which will supplement as well as protect our own natural resources. No one energy source is going to fix the problem…you need a combination of different energy sources."

In the end, however, Dr. Berry has a positive outlook on the future of solar energy and feels driven to contribute to its success.

"I am really optimistic that at some point solar will become the big player in the game, and I would love to have a piece of that."

> **"I am really optimistic that at some point solar will become the big player in the game, and I would love to have a piece of that."**

W hen it comes to training cybersecurity students, Dr. Mengjun Xie from the UA Little Rock Department of Computer Science is not satisfied with teaching just the basics. He wants students to know what it's like to handle cybersecurity attacks in the real world.

"When you just teach about theories, that's kind of difficult to keep [students'] attention…we want to train our workforce in a very effective way."

Thanks to a grant from the National Science Foundation, Dr. Xie and his team have received $276,424 to develop a cybersecurity platform that allows students to train for cybersecurity competitions and education. This platform, called PROMISE, allows students to learn in a virtual cloud- based environment using different cyber-attack scenarios.

Using mostly free software, students can log into a cloud-based system, select what they want to work on, and immediately go through different learning modules and real-world scenarios to enhance their learning of cybersecurity. Working alongside Dr. Xie are senior personnel Drs. Chia-Chu Chiang, Professor of Computer Science Amy Sedivy-Benton, Associate Professor of Teacher Education, and Dr. Shucheng Yu, Associate Professor of Computer Science.

Building Cybersecurity Leaders
Dr. Mengjun Xie Prepares Students for Real-World Attacks

Cybersecurity Competitions
The initial investigation for this project began in late 2012 when Dr. Xie formed a small team of students for the Southwest Regional Collegiate Cyber Defense Competition. This cyber defense competition challenges students to problem-solve different scenarios that arise when working in an IT department for a company. While the company they're serving is fake, the issues they face are not.

As Dr. Xie watched his students competing in this intense environment, he realized this type of learning can be more beneficial than the traditional method of teaching cybersecurity in classrooms. He wanted to take this competitive environment and apply it to the Department of Computer Science at UA Little Rock. He and his team believed a cloud-based learning environment that incorporated scenarios with real computing systems would be the best solution.

"We wanted to create [an] environment that can be automatically generated in the cloud, but give students a sense of real systems."

Dr. Xie and his team realized it would not only benefit students on the team, but also greatly assist cybersecurity students not on the team, especially in traditional lab-based assignments. While these labs involve small-scale environments, the cybersecurity competitions and PROMISE platform can allow larger teams and more complex scenarios.

New Paradigm in Computing
Dr. Xie believes that the cloud environment in the PROMISE platform is actually beneficial to the students, since many businesses are moving to cloud-based computing and away from local physical hardware devices to store their data.

smart. But more and more people are realizing that personal data is very important [and realize that] we should do something to protect our data."

Because of this growing awareness, he predicts that cybersecurity will become broader in its scope to accommodate for not only desktop environments, but for smartphones, tablets, and smartwatches. As users become more aware of cyber attacks, they will require some basic level of protection for their devices. He compares this awareness to healthcare in the United States. Diseases such as the flu are not as dangerous as they used to be in the U.S. because our healthcare structure offers a basic level of protection through medication and proper care. In the same way, we will be able to offer more secure services that will make us less vulnerable to common attacks.

Future Collaborations

Dr. Xie is continually working to enhance the PROMISE platform for students and is hopeful that he can collaborate with experts in social sciences, behavioral sciences, education, and psychology to observe different learning styles and improve learning outcomes. By becoming more aware of unique learning styles, he can tailor the platform to enhance student success and achievement for the future, which will in turn enhance cyber defense security for all of us.

The cloud infrastructure allows users to store their information on remote servers that can be downloaded to any device at any time. This outside infrastructure means that the user does not spend time maintaining local hardware and servers.

"They do not maintain real hardware. Their system, software, and applications are all stored in some cloud computing platform, like Amazon, Rackspace, or Google Cloud…when we create such a virtual environment, it will give the students the exact same feeling when they go to their job after they graduate and go to real companies."

Current State of Cybersecurity

Dr. Xie describes the cybersecurity landscape today as an "arms race" with no end.

"There is no definite winner. This is really a game between two groups of people who are both very

…when we create such a virtual environment, it will give the students the exact same feeling when they go to their job after they graduate and go to real companies."

Ingrid Safina is a third-year PhD student in the Applied Biosciences program at UA Little Rock. Having a background in biology, she works with Dr. Bao Vang-Dings and Dr. Alex Biris at the Center for Integrative Nanotechnology Sciences on skin regeneration research, which may be used one day to heal wounds and burns. Ingrid sat down with us to talk about her experience working at the Center.

What brought you to UA Little Rock?

I started school at UA Little Rock in 2009. The university had a partnership with Rwanda, my home country, and was sponsoring students majoring in the sciences. All of us in the chosen group received a full undergraduate scholarship through the program.

Could you tell me about your work with the Center for Integrative Nanotechnology Sciences?

The project ties into my field of biology. Dr. Biris, Dr. Vang-Dings, and their team synthesize different nanomaterials, and I use them to explore skin regeneration techniques. The goal of the project is to create a skin substitute that can be implanted into wounds, especially deep wounds like burns, to accelerate the healing process. This healing process can even regenerate cells and proteins that were lost in an injury.

What interests you about this research?

In my undergraduate studies, I took a class called tissue engineering, which I loved. Most of the biology projects in the Center pertain to tissue engineering and regeneration. I don't like the idea of solely relying on chemotherapy to cure diseases. Chemo is effective in combination with nanomaterials because they direct chemicals to the right target (affected cells or tissue) and thus by sparing the healthy cells/tissues. A lot of the materials used in the Center are biocompatible, since they are made up of carbon and we are mostly made of carbon. Even though these materials are foreign to our bodies, they have a lot of similarities. I love the fact that these materials can help our bodies regenerate skin without the use of medicine.

How would you like to see this research move forward?

We are still at the beginning of this project, so everything is happening in the lab. I would like to see this project one day used in clinical trials and the market. I would like to see a day when someone could walk into a pharmacy, buy a regenerative material off the shelf, and immediately apply it to their wound. It would be easy, non-toxic, and hopefully affordable.

What are your plans for after you graduate?

I would still like to do research after I graduate. My first choice would be to work somewhere like the FDA or any company that hires researchers in my field. My second choice would be academia, where I could stay at the university doing research or teaching.

A Three-Cord Strand Not Easily Broken

UA Little Rock TRiO Program Continues to Help Disadvantaged Teens and Adults Achieve Post-Secondary Success

Preparing for your educational and career future can be a daunting task for anyone, whether you are a teen about to graduate high school or an adult looking to advance your career. Support from others is an essential component for navigating the process of admission, financial aid, career counseling, and degree track. Those who come from disadvantaged backgrounds, such as families with low socio-economic status, children of parents without a higher education degree, or students with disabilities, may not have the resources and assistance available to know how to plan a post-secondary future. Because of these barriers, the process of admission and financial aid application can be overwhelming.

The UA Little Rock TRiO Programs' four higher education access programs, housed in the University Plaza building, exist to propel students in specific target areas in Arkansas that need assistance in preparing for a post-secondary future. These programs include the Talent Search Programs (Talent Search 1 and Talent Search 2, and the Educational Opportunity Centers (EOC 1 and EOC 2). (In addition, UA Little Rock also hosts two college-based TRiO programs, Student Support Services, and the McNair Scholars Program located in the Speech building.) Recently, UA Little Rock TRiO won a new five-year

grant totaling of $1,179,995 for the Talent Search 2 Program in North Pulaski County, along with another five-year grant totaling $1,179,985 for an EOC2 in the Arkansas Delta region. The continuing Talent Search 1 and EOC 1 five-year grants are funded at $2,562,040 and $1,351,450, respectively. These grants are awarded by the U.S. Department of Education.

Linda Barker, who became director of UA Little Rock TRiO in 2008 and has worked in the program since 1981, describes how essential it is to support these students early in their education: "One of the key parts about TRiO is that it is a pipeline, so to speak, from middle school, to high school, and then to college or other post-secondary opportunities. We're not strictly college-focused because everybody is different in what they desire to achieve. Through TRiO, there is an opportunity to positively impact the educational and economic needs of our target communities."

Tradition of Support

TRiO is a federal program administered by the Student Service area of the Department of Education's Office of Postsecondary Education. The program originally began as the Upward Bound Program under the authority of the Economic Opportunity Act of 1964. Once the Talent Search and Student Support Services programs were

created, they formed a "trio" of programs to help disadvantaged students.

The UA Little Rock TRiO Talent Search Program began in 1981 providing educational counseling for participants in central, west-central and south Arkansas. In 1998, they received funding for an EOC for adults looking for assistance in post-secondary educational opportunities.

Talent Search Programs for Pulaski and Jefferson Counties

The Talent Search Program is designed to identify and assist students from disadvantaged backgrounds who show potential for post-secondary success. Currently, the Talent Search program provides services for students at target high schools in Pulaski County, including north Pulaski County, and Jefferson County.

This program includes a number of activities and workshops, including admission and financial aid workshops, student achievement assessments, online tutoring program access, college campus tours, leadership and motivational sessions.

Recent Census Bureau data show the relevance of the Talent Search Program in these target areas. 48.3 percent of families in the first target area are considered low-income, while the national average is 17.8 percent. 76 percent of students in the target school districts participate in free and reduced lunch programs. In the north Pulaski County target area, 47 percent of families are considered low-income and 64 percent of students participate free and reduced lunch programs.

On the academic side, only 26 percent of these students in the first target area are taking AP courses. In the north Pulaski County target area, only 14 percent of students are taking these courses. In both target areas, post-secondary enrollment rates are lower than the state and national rates. Talent Search services make a difference in a student's ability to attend and complete a higher education program.

> **"We're not strictly college-focused because everybody is different in what they desire to achieve. Through TRiO, there is an opportunity to positively impact the educational and economic needs of our target communities."**

Educational Opportunity Center

The EOC assists disadvantaged students 19 and older looking to broaden their post-secondary future. EOC 1 serves clients in Lonoke, Pulaski and Saline Counties. EOC 2 Delta's target area includes 12 counties in east and southeast Arkansas. The EOC program offers workshops, literacy sessions, financial aid assistance, entrance exam preparation, computer lab tutorials, individual counseling, and computerized placement exams, which evaluate reading, writing, and mathematics skills. These exams will then outline a specific plan of action for post-secondary work.

Along with academic guidance, the EOC staff provide career services, counseling, and opportunities to explore different career paths. Thanks to community partners, TRiO is able to provide unique career day workshops and skill development activities.

Support from UA Little Rock Community

Linda Barker has been especially grateful for UA Little Rock's support of the TRiO Talent Search and EOC Programs over the years. In 2008, the university provided renovated space in University Plaza for offices, classrooms and a computer lab. This space is critical for providing access to TRiO services for central Arkansas residents. With the addition of a new Talent Search and a new EOC programs in 2016, Chancellor Andrew Rogerson and Vice Chancellor for Finance and Administration Steven J. McClellan were instrumental in securing additional office space for the additional employees.

"UA Little Rock has been very generous in providing us space…and the administration has always seen the value of the programs. Talent Search and EOC are important components of UA Little Rock's community-focused mission."

She is also grateful for the UA Little Rock Office of Research and Sponsored Programs for their assistance in helping TRiO receive their funding.

"The ORSP staff has a critical role in the grant application process. The staff's expertise in grant development, grant submission, and the pre-award/post-award support is exceptional."

Students Making an Impact

2017 UA Little Rock Research and Creative Works Expo Allows Students to Engage in Real-World Research

Research is one of the best ways for students to gain real-world experience, discover their passions, and prepare for their future careers. Thanks to the UA Little Rock Student Research and Creative Works Expo, students can showcase their research and creative projects to the campus community.

Sponsored by the Student Research and Creative Works Council and the Office of the Vice Provost for Research, the Student Research and Creative Works Expo gives undergraduate and graduate students a chance to showcase their projects. This year, students presented projects from engineering and technology, human sciences, life sciences, physical sciences, health sciences, professional studies, social sciences, education, and the humanities.

UA Little Rock Chancellor Andrew Rogerson expressed his delight in the students' showcase of their work at the Expo.

"It does my heart proud to see this, because this is something I'd like to extend across all the learning we have at this university," reflects Rogerson. "It's really an example of how to teach students the application of knowledge--how to make them more creative, how to make them better collaborators, and in turn make them better graduates of this great university."

Students were judged based on the quality of their presentation, uniqueness of their research, ability to summarize problems and findings, and the soundness of their methodology.

Dr. Jeremy Ecke, the Chair of the Research and Creative Works Committee and lead organizer of the Expo, explains how this year's Expo has expanded to incorporate different technologies and disciplines.

"This year we have near 100 presentations, including poster board presentations. But we're also piloting some digital hub presentations. We have an installation of a concrete canoe, a live podcast, and a documentary film."

A list of expo winners and their projects include:

Undergraduate Winners

Art: Zachary Tallent, "The Broken Chain"

Humanities: Kalan Horton, "Identifying the Key Social Infrastructural Factors in School Buildings That Affect 12th Grade Students' Standardized Test Scores in three school districts"

Engineering/Technology
First Place: David Stinnett, Matthew Mitchell, Patrick Phillips, Jeff Choate, Jessica Vinson, Daniel Blaire, Dylan Singleton, Abdulaziz Alanazi, Norbert Rungano, Julian Castillo, Drew Potter, and Fidele Kabera; "Multi-Purpose Tornado Shelter"

Second Place: Deepali Lai, Michelle Poroshine, and Logan Vickery; "Data Analysis of Consumer Complaints"

Life Science/ Human Science
First Place: Marina Avram, Sakr Elsaidi, Tyler Maxwell, and Bonn Belingon; "Algal Oculata Biotemplated Water-Splitting Nanocatalysts Nickel/Iron Oxides"

Second Place: Lelia Rosenkrans; "Physiological Relationships Between Salivary Expressed Metabolites and Dancer Fitness"

Physical Sciences
First Place: Tyler Maxwell, Marina Avram, Sakr Elsaidi, and Bonn Belingon; "Nannochloropsis Oculata Biotemplated Water-Splitting MoS2 Nanocatalysts for Hydrogen Production"

Second Place: Autumn Jones; "Petrographic examination of the El Hammami H5 meteorite from the UA Little Rock Meteorite Collection"

Social Sciences/Professional Studies
First Place: Wesley Bland; "Determining a Champion: Economic Analysis of NFL Teams"

Second Place: Suzanne Abou-Diab; "Evaluation of the Readability, Validity, and User-Friendliness of Aphasia Written Web-Based Patient Education Materials"

Second Place tie: Kiana Manning; "An Investigation to Document Interjudge Reliability of Two Standardized Measures of Social Skills"

Innovation
Winner: Blake Johnston and Sam Kincannon; "Concrete Canoe"

Winner: Jasmine Blunt and Kendrick Dunn; "Media Platform"

Graduate Winners

Engineering/Technology
First Place: Wei Dai; "Measuring Data Quality of Global Earthquakes"

Second Place: Trigun Marco; "Novel Mechanism for Object Manipulation and Grasping for Unmanned Aerial Vehicles"

Third Place: William Parsley and Wei Dai; "Improving Data Quality Through Machine Learning"

Health Sciences
First Place: Yan Wang, Jing Jin, Susan Thapa, Leanna Delhey, and Qing Zhang; "SNP Imputation and Cardiovascular Health Study"

Second Place: Asween Marco; "Oral Health Access in Arkansas"

Third Place: Qudes Al-Anbaky, Zeiyad Al-karakooly, Ilham Kadhim, Mohd Zubair, and Richard Connor; "Dictyostelium discoideum Senses Inositol Polyphosphate-Mediated Programmed Cell Death Mechanism Following Exposure to Single Walled Carbon Nanotubes (SWCNTs)"

Humanities/Social Sciences/Education
First Place: Amy Cole; "Dorothea Lange and Ben Shahn: Separate Paths Lead to Similar Mother Figures in Farm Security Administration Photography"

Second Place: Brenda Prochaska and Erin Pavioni; "Disproportionate Sanctions: A Comparison of Judicial Handling of Male and Female Southern Minority Youth"

Life Science/Physical Science
First Place: Matthew Carey; "Temporal and Spatial Changes in the Water Quality of the Arkansas River Through the Little Rock Metropolitan Area"

Second Place: Amita Nakarmi and Rebecca Parker; "Removal and Recovery of Phosphate from Wastewater Using Novel Reusable Renewable Resource-based Nanocomposites"

Second Place tie: Kamal Pandey; "Regulation of productivity of Ornamental crops by Carbon-based Nanotechnological Approach"

Third Place: Ghusoon Al-Bazzar and Muatez Mohammed; "Dye-sensitized solar cells (DSSCs) for TiO2 nanorods with SWCNTs/Polyaniline"

Launching Out into the Deep

Five UA Little Rock Students Win Highly Competitive Research Grants from the Arkansas Department of Education

For six straight years, UA Little Rock undergraduate students have been awarded grants from the Arkansas Department of Higher Education's (ADHE) Student Undergraduate Research Fellowship (SURF).

According to Jonathan Coleman from ADHE, 244 total students applied for fellowships, and the UA Little Rock students were part of a group of 78 successful applicants.

Each SURF winner has designed their own research projects and will be under the supervision of faculty mentors for guidance and support.

UA Little Rock SURF Projects

Jacob Bonfanti, a sophomore computer science major, will research and develop a homomorphic encryption scheme with his mentor, Dr. Chia-Chu Chiang from the Department of Computer Science. Cloud-based computing environments allow users to store data files on a server at an alternate location. This data can be retrieved on any internet-connected device in any location. While users have to retrieve the data using a username and password to their cloud-based account, it is still not as secure as local files stored on a physical hard drive that can be encrypted for further protection. Encryption allows a file to be turned into secret code that can only be read by someone who knows the unique key combination. This security measure is especially important when transmitting data from one device to another, as someone cannot hack into sensitive information as it is being sent.

Because homomorphic data encryption is not fully developed in cloud computing services, Bonfanti, with his mentor Dr. Chia-Chu Chiang from the UA Little Rock Department of Computer Science, wants to provide an encryption scheme that provides more security for this type of storage. This type of encryption, known as "fully homomorphic" encryption, was first developed in 2009. However, at the time it was considered too impractical for widespread applications. Bonfanti's goal is to take this encryption scheme and apply it universally to a wide range of practical applications.

Emily Phillips, a junior majoring in Anthropology and Spanish, will transcribe the music and stylistic elements of "Fiddlin' Banjo Billy Mathews." Mathews,

who has resided in Carroll County, Arkansas, since 1975, is a world-renowned fiddle player known for his intricate and unique playing style. He has been performing for over 40 years and has greatly contributed to the American folk music catalog. Under the supervision of her mentor, Dr. Juliana Flinn of the UA Little Rock Department of Anthropology, Phillips will transcribe Mathews' recordings and identify unique elements that highlight his signature style on paper.

Mathews began playing music on the banjo and later learned to play the fiddle. Due to the influence of his banjo playing, he was able to mimic banjo techniques on the fiddle, such as "pull-offs," "hammer-ons," and "slides." By transcribing these recordings, Phillips can investigate how his style has been influenced by the traditions of other regions and players. She will also see how his playing style differed from those who previously played these tunes. Phillips will specifically transcribe the audio recordings on the album, *500 Fiddle Tunes: Old-Time Archive*, using music transcription software. Her goal is to make Mathews' songs and playing style more accessible for other players to emulate.

Leila Rosenkrans, a dance major minoring in chemistry, is researching metabolic pathways, the series of chemical reactions within a cell, in dancers to improve their fitness levels. She will be under the supervision of Professor Samantha Johnson from the Department of Theatre and Dance. Rosenkrans will study metabolites that are specifically developed in saliva. To conduct the study, ten students enrolled in a dance course at UA Little Rock will give saliva samples on three different dates throughout the semester, both before and after the class. Rosenkrans will analyze the collected saliva for concentrations of glucose, lactate, non-esterified fatty acids, cortisol, and heat shock protein 70. The data collected from these samples will evaluate how each dancer's metabolic pathways are utilized along with the amount of stress experienced throughout the class. Rosenkrans will also present a survey to the dancers that addresses individual health and stress levels.

In collecting these samples, Rosenkrans wishes to uncover and develop three major conclusions. First, she wishes to highlight the statistical relationships between gender, race, and self-reported fitness level and how they are related to the metabolites found in saliva. Second, she wishes to determine how the effects of acute and chronic conditioning over fourteen weeks will affect the concentrations of metabolites found in saliva. Third, Rosenkrans wishes to determine if the survey answers from the dancers reflect their biomarkers found during testing.

Grace Rutter, a junior majoring in Biology, will study the dynamics of cyanobacteria in six recreational lakes in Little Rock. Cyanobacteria, often incorrectly called blue-green algae, is a type of nitrogen fixing bacteria that resides in water and other moist environments. This type of bacteria converts nitrogen gas from the air into a solid microorganism that is beneficial to plants.

While cyanobacteria contributes to the aquatic ecosystem, it can also be harmful to humans and other types of organisms due to its production of harmful toxins. Scientists have discovered a connection between cyanobacteria and a specific form a dementia in Guam.

Rutter and her mentor, Dr. Scott Woolbright from the Department of Biology, will investigate the presence of cyanobacteria in six recreational lakes maintained by Little Rock Parks and Recreation. With this investigation, she will use new microscopy techniques to look for unforeseen microbial interactions. One technique she will use is "double labeling of oligonucleotide probes fluorescent in situ hybridization" (DOPE-FISH) which will identify different species of bacteria associated with cyanobacteria. Other methods such as electron microscopy cannot distinguish these groups as easily as DOPE-FISH.

Shelby Wingate, a junior majoring in systems engineering, will research and analyze how the brain processes signals when a limb is moved using pattern recognition classifiers, a technique used to recognize and track specific brain signal patterns. By analyzing these signals, she can then apply a technique to emulate this process for users who need prosthetic technology.

Electromyography, which is most commonly used to diagnose neurological and neuromuscular disorders, can be used to record these electrical signals in muscle tissue. Wingate and her mentor, Dr. Kamran Iqbal, Professor of Systems Engineering, will analyze neural signals during hand movements by applying pattern recognition classifiers, a technique that will recognize specific patterns and relationships between neural signals and hand movements.
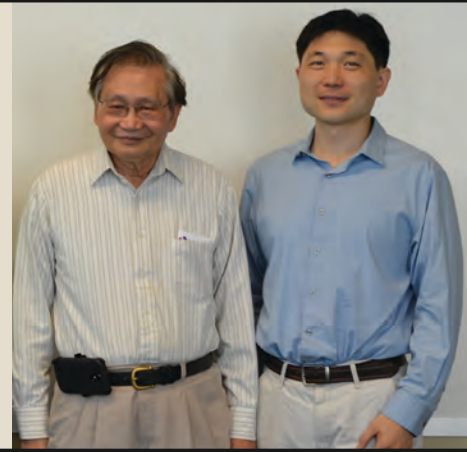
During her year of research, Wingate will explore how motor neurons will perform in hand movements. Next, she will build a model of the arm movements that employ muscle synergies, the coordinated movements of groups of muscles.
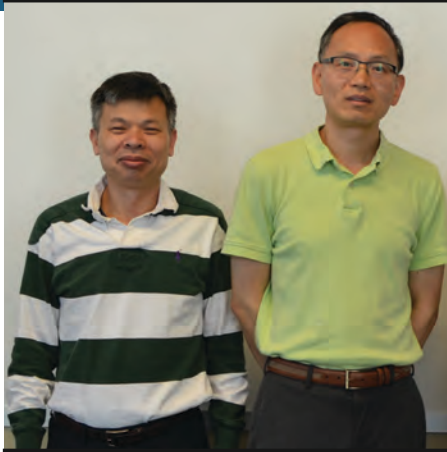
Advancing the Renewable Energy Miracle

2017 Seed Grant Winners Dedicated to Improving Hydrogen Production for a Carbon-Free Future

From left to right: Dr. Qingfang He, Dr. Wei Zhao, Dr. Tar-pin Chen, Dr. Shanzhi Wang

Over the past several years, scientists and engineers have worked diligently to develop sustainable solutions for energy production. By using renewable forms of energy, we can find cleaner solutions to lessen our dependence on fossil fuels. Referring to our current energy infrastructure, Bill Gates acknowledges that "we need energy miracles." Thanks to four professors from UA Little Rock, the dream of using renewable energy will one day become a reality.

Dr. Wei Zhao, from the Department of Chemistry at UA Little Rock, Dr. Tar-pin Chen from the Department of Physics and Astronomy, Dr. Qingfang He from the Department of Biology, and Dr. Shanzhi Wang from the Department of Chemistry have won $50,000 from the internal UA Little Rock Research Cluster Seed Grant Competition. This competition supports innovative, interdisciplinary research projects from tenured faculty, tenure-track faculty, and full-time staff at UA Little Rock.

Efficient and Affordable Hydrogen Production

Dr. Zhao and his team will create nanostructured materials for hydrogen fuel production. Currently, hydrogen is created using high-temperature steam and natural gas, which releases carbon into to air. The most promising method today is a process called photoelectrochemical (PEC) hydrogen production. In the PEC process, a unique semiconductor captures solar energy and splits water into hydrogen and oxygen without releasing carbon into the air. Hydrogen fuel can then be stored and used in place of fossil fuels.

While PEC production is promising, the materials required are too expensive to match the value of fossil fuels. Dr. Zhao and his team will create nanostructural materials formed from cyanobacteria, a type of blue-green bacteria (often incorrectly called blue-green algae) found in wet environments, and silkworm-produced silk. These materials can then produce and store hydrogen fuel. By creating these unique nanostructures made from natural resources, they can create cost-effective materials that support robust production and storage of hydrogen fuel.

Dr. He, an expert in cyanobacteria studies, explains why using the PEC process would help speed the process of hydrogen fuel production.

"Some of cyanobacteria naturally produce hydrogen and split water to produce oxygen while turning carbon dioxide into sugars. But this hydrogen production and photosynthesis, like any life processes, is very sensitive to environmental changes. This limits the applications of cyanobacteria in spite of many advantages they possess. Cyanobacteria are actually highly tolerant to heavy metals and that's one of the characteristics we're looking for. By feeding cyanobacteria with heavy metals and carbonizing their cells using our technology, we're hoping that it works better than natural processes and produces hydrogen more efficiently."

Creating New Reactions

The nanostructural materials used to produce the oxygen and hydrogen are also a unique aspect to this project. Normally, expensive noble metals such as platinum and iridium are used in this role, but their high cost makes them difficult to use on a large scale. Dr. Zhao and his team are instead using earth-abundant chemical compounds such as molybdenum disulfide, which is a semiconductive mineral that by itself in bulk does not undergo a water-splitting chemical reaction when immersed in water. However, Dr. Tar-Pin Chen and a team of researchers have made this specific mineral catalytic for the water-splitting reaction, in nanosized dimensions and/or in a metallic form, which will then allow it to split hydrogen and oxygen efficiently. Using molybdenum disulfide is more cost-effective than the traditional use of platinum.

"Normally, the metallic molybdenum disulfide is not stable," Dr. Zhao explains, "but Dr. Tar-Pin has made this compound stable in water. So it works for water splitting hydrogen production."

Reaching out to the Community

The research team will collaborate with Mesolight, LLC, a local industry specializing in nanomaterial-based solar cells and water-splitting studies, and Little Rock Central High School. By including students from Little Rock Central High School, Dr. Zhao and his team hope to encourage future scientists and engineers.

The research team hopes to someday create a center for bioenergy on the UA Little Rock campus. With this center, researchers would be able to discover new forms of energy production using renewable biomaterials, abundantly available from the natural state Arkansas. With this seed grant, Dr. Zhao and his team have set the foundation for extensive bioenergy research at UA Little Rock.

LENDING A HAND

UA Little Rock Works with Interdisciplinary Team to Help Children with Developmental Disabilities in Arkansas

Children with developmental disabilities can face enormous obstacles in their lives as they grow, go to school, and interact with friends and family. The Center for Disease Control and Prevention (CDC) defines developmental disabilities as "a group of conditions due to an impairment in physical, learning, language, or behavior areas."

According to a recent report from the CDC, 15 percent of children aged 3-17 in the United States are affected with a developmental disability. Examples of developmental disabilities include ADHD, cerebral palsy, hearing loss, vision impairment, learning disorders, and autism spectrum disorder.

Without adequate knowledge, parents can feel confused and helpless in their pursuit to help their children receive the assistance they need. Thanks to the Arkansas Leadership Education in Neurodevelopmental and Related Disabilities (LEND) program, children and adolescents with developmental disabilities can find the services they need to work through their obstacles.

Helping Arkansas Families

The Arkansas LEND program, which originally began in the 1980s, is an interdisciplinary effort from 16 unique professions. Currently, it is one of the largest LEND programs in the United States with the highest level of funding.

UA Little Rock works alongside UAMS, University of Central Arkansas, UA Fayetteville, and the University of Southern Mississippi. Their services include nutrition, audiology, occupational therapy, social work, physical therapy, psychology, speech language pathology, special education, pediatric services, law, family and self-advocacy. In the self-advocacy track, LEND assists adults with developmental disabilities to become advocates for people with disabilities.

Dr. Greg Robinson from the UA Little Rock Department of Audiology and Speech Pathology is part of the LEND research team and devotes a considerable amount of time assisting families in the program.

"It's one of my favorite things to do at the University," reflects Dr. Robinson. "I always learn something new every time I go…I feel very fortunate to be on this grant."

Every Friday afternoon throughout the year, a team of student researchers gather at UAMS in Little Rock to hear research experts in the field give presentations on developmental disabilities. They also use this time to invite families who need assistance and don't know where to turn for help. Even if the child or adolescent has not received an official diagnosis for their condition, the family can still reach out for assistance from the LEND program.

After the family shares their story with researchers and students, the students are required to perform independent research related to the issues presented. When they meet again, they present their information to the family and research team. At the end of the project, the family is presented with a custom research book that documents their particular issue and the best practices and treatments available.

Dr. Robinson knows how important the LEND program is to Arkansas families. Because Arkansas has one of the largest LEND programs in the country with the highest level of funding, the research team makes an effort to assist LEND programs in other states. Currently, they work with the University of Southern Mississippi.

Community Outreach
The Arkansas LEND program also supports community outreach efforts to assist children and families who

need healthcare in under-represented areas of Arkansas. The interdisciplinary team currently works with the Daughters of Charity Services in Gould, AR and Dumas, AR. These areas are considered "medical deserts" because of the lack of pediatric services. The Daughters of Charity is a religious order of the Catholic Church that offers healthcare and social services to low-income citizens.

> **"We will test the children, give them an array of assessments, and try to talk with the family to put some systems in place that will help them thrive"**

"We go down there and take vans full of people, and we get assigned a family that has complex healthcare needs" explains Dr. Robinson. "We will test the children, give them an array of assessments, and try to talk with the family to put some systems in place that will help them thrive."

Arkansas LEND is preparing a set of outreach workshops in Dumas to help educators introduce positive reinforcement in the classroom. These workshops will help teachers encourage good behavior without always going to punishment by providing incentives and rewards for good behavior.

LEND researchers also assist with clinics in other areas in Arkansas, including Conway and Mountain Home. Dr. Robinson also directs the Preschool Language Enrichment Program, another LEND-affiliated program.

"The effect of the LEND grant just within the state of Arkansas has an exponential impact on the area as a whole," says Dr. Robinson.

Accelerating Student Research
The LEND Program places a great emphasis on student research and development. Over 40 students are currently contributing to the project, and each one has to devote over 300 hours over the course of two semesters on the project. Dr. Robinson's next goal is to bring students from the Arkansas Consortium for the PhD in Communication Sciences and Disorders on board, which will enrich their research opportunities even more.

Because students are responsible for researching issues of each family that seek help from the program, they gain considerable real-world experience in this type of analysis. The Arkansas LEND program describes this learning process, "solution-focused learning," which is built off of the "problem-based learning" model. In this model, students work in teams to define the specific problem, discover the various avenues to solve the problem, find the tools they need to use to discover the solution, find the solution, and report the findings.

Because they specifically deal with families, they wanted to specifically name this framework, "solution-based learning."

"We didn't want to call a family a 'problem'," says Dr. Robinson.

Overall, this model provides a comprehensive study of the unique challenges these families face and provides a holistic approach to help the children and adolescents acquire the skills they need to live healthy and productive lives.

NO LAUGHING MATTER

UA Little Rock Center for Arkansas History and Culture Launches Online Exhibit to Show Impact of Political Cartoons in Arkansas

Small Beginnings, Big Ideas

In 2016, archivist Shannon Lausch and director of technology Chad Garrett from the UA Little Rock Center for Arkansas History and Culture conducted a workshop to show teachers, librarians, and archivists the process of creating online exhibits. For workshop activities, students digitized portions of the political cartoon collection stored at the Center.

Realizing the collection can showcase a unique form of Arkansas history, The Center decided to seek grant funding to develop this project into an online exhibit.

They enlisted the help of graduate assistants Danielle Butler and Jessica Erwin at The Center to assist with writing the grant for the project. Thanks to a $10,424 grant from the Arkansas Humanities Council and the National Endowment for the Humanities, The Center was able to move forward with their project.

Moving Forward

With grant funding secured, they began the digitization process. Bridget Wood, who was a graduate assistant at the time, processed and digitized the vast political cartoon-related material held at The Center, from metal printing plates, to charcoal sketches, to final prints. After she digitized and processed the collection, The Center created an online exhibit, No Laughing Matter: Political Cartoons and the Arkansas Historical Perspective. This exhibit, which features original works from veteran Arkansas political cartoonists Jon Kennedy and Bill Graham, showcases a vast history and analysis of the political cartoon landscape in Arkansas. Contributors from UA Little Rock, E-STEM Charter School, and the Arkansas Democrat Gazette wrote essays and created lesson plans to help visitors and students understand the historical, rhetorical, and cultural impact of political cartoons.

Building upon the online exhibit, The Center held a symposium at the Arkansas Curriculum Conference at the Statehouse Convention Center in downtown Little

John Deering presenting with Dr. Barclay Key

NO LAUGHING MATTER
Political Cartoons and the Arkansas Historical Perspective

NOV. 3, 2016

Petit Jean Room
Little Rock Marriott Hotel and Statehouse Convention Center

Hosted by the Center for Arkansas History and Culture.
Supported in part by the Arkansas Humanities Council
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UALR | CENTER FOR ARKANSAS HISTORY AND CULTURE

Arkansas Humanities Council

Rock. Held in November 2016, the event examined how satire, historical events, and the cultural landscape of the time can affect the human condition and effectively persuade a person's thinking.

John Deering, editorial cartoonist and illustrator for the Arkansas Democrat Gazette for 30 years, presented with **Dr. Barclay Key** of the Department of History. **Dr. Joseph Giammo** of Political Science, and **Dr. Revis Edmonds** from the Arkansas Department of Natural Heritage. **Dr. George Jensen** of Rhetoric and Writing, **Dr. J. Bradley**

for the Arkansas Democrat from 1941-1988, and Bill Graham worked for the Arkansas Gazette from 1948-1985.

Standing the Test of Time

In the online exhibit, Dr. Joseph Giammo explains how political cartoons gained popularity when Benjamin Franklin published his "Join or Die" cartoon

Dr. George Jensen presenting with Dr. J. Bradley Minnick

Minnick of English, **Chad Garrett**, **Shannon Lausch**, and **Stan James** from E-STEM Charter School also presented.

Learning History through Cartoons

For generations, political cartoons have used humor, satire, and images to comment on the political and cultural landscape of a society. Dr. George Jensen explains in the exhibit that, "A simple way of thinking about any form of satire, including political cartoons, is that it throws values into the air, questioning everything, to see which values hold up and which seem dangerous or outmoded."

In Arkansas, political cartoons highlighted important moments in the state's history, including the election of Winthrop Rockefeller in 1967, which marked the first Republican governorship since reconstruction, the Central High Crisis in Little Rock, and the presidency of Bill Clinton in 1992.

Before the *Arkansas Democrat* and *Arkansas Gazette* merged into the *Arkansas Democrat-Gazette*, Jon Kennedy and Bill Graham were competitors from the two separate newspapers. Jon Kennedy worked

"A simple way of thinking about any form of satire, including political cartoons, is that it throws values into the air, questioning everything, to see which values hold up and which seem dangerous or outmoded."

in 1754. 250 years later, the media landscape has changed significantly. But even though we now have a variety of ways to consume political ideas, opinions, and information, political cartoons remain a relevant medium for communicating commentary on political affairs and opinions. Dr. Giammo explains that political cartoons give readers a clear and succinct way of viewing messages that may otherwise be ignored:

"Political cartoons, which allow messages to be quickly and powerfully communicated to their readers, provide an opportunity to reach people who might otherwise ignore the messages we want to send. This is why, even as so much about the way we communicate with each other has changed, they remain an important part of the political landscape more than 250 years since they first appeared in an American publication."

*To see more of The Center's exhibit, visit their website at **ualrexhibits.org/laughing***

Life in the (Safe) Lane

UA Little Rock Survey Research Center Helps Arkansas Highway Safety Office in Campaign to Reduce Traffic Fatalities

Highway safety is a vital component to the welfare of all Arkansas residents. Because Arkansans primarily rely on roadways for travel, it is essential to create a safe environment for everyone. Thanks to the UA Little Rock Survey Research Center, highway safety administrators can more effectively create a safe roadway environment. The Survey Research Center is teaming with the Arkansas State Police and the Arkansas Highway Safety Office (AHSO), which is funded by the National Highway Traffic Safety Administration (NHTSA). They will use data from surveys to determine reported driving behaviors, awareness attitudes, and opinions on various highway safety issues.

Further, future surveys will serve to measure changes in attitudes and behaviors with regard to important highway safety programs, all designed to save lives. The AHSO also utilized advertising agency CJRW to develop a statewide media plan, develop creatives, and purchase air times for TV, radio and electronic media. Based on the data collected and analyzed from the Survey Research Center, the AHSO can evaluate the effectiveness of these marketing campaigns.

Measuring Effectiveness

In order to effectively measure the impact of these campaigns in reaching the targeted audiences with the specific safety messages, AHSO needs data to determine the results of their efforts. That's where the Survey Research Center comes in. Being the only general academic survey research center in the state, the Survey Research Center conducted telephone interviews, formed questions, created reports, and analyzed data for the AHSO.

In a statewide telephone survey, Survey Research Center asked questions on driving behaviors such as seat belt use, texting or cell phone use while driving, speeding, drinking and driving and opinions on enforcement of traffic safety laws. These surveys also serve to inform state officials of the penetration of their public information and education paid media efforts by asking about recall of campaign slogans. These campaigns include "Click It or Ticket," "Drive Sober or Get Pulled Over," "Obey the Sign or Pay the Fine," and "U Drive. U Text. U Pay."

"Our valuable partnership with UA Little Rock allows us to evaluate [data] to make the most effective use of

funds in reaching our targeted audiences," says Ann Whitehead, Safety Program Manager at AHSO. "It would not be the most effective use of our limited funds if we didn't measure how and if our messages are received."

"Survey Research Center helped us identify if the public really saw the TV spots, heard the radio advertisements, or saw the billboards," said Whitehead. [We can ask the following questions:] What worked and what didn't work? Do they know law enforcement is out there? Do they support traffic safety laws? Are they concerned that they're going to get a ticket?"

> **"Our valuable partnership with UA Little Rock allows us to evaluate [data] so we can show the most cost effective use of our limited funds in reaching our targeted audiences."**

This data compilation also assists the AHSO with their annual Highway Safety Plan report, a required document sent to NHTSA. This report identifies safety-related issues in the state and provides recommendations to reduce traffic fatalities and injuries. At times, the Arkansas Legislature requests data collected by Survey Research Center.

Toward Zero Deaths

Whitehead explains that the overarching goal of the Highway Safety Plan is zero deaths on Arkansas roadways.

"We're trying to change community norms, just like the success of the stamp out smoking tobacco campaign. It needs to be socially unacceptable to get in a vehicle without buckling your seat belt, breaking traffic laws, or driving drunk or distracted."

Thanks to the collaboration with the UA Little Rock Survey Research Center, the AHSO can see if their public information messages are reaching motorists and changing their unsafe behaviors. "Zero Deaths on our roadways is our goal. Even one death is too many."

Survey Research Center Director Cindy Bennett has worked closely with the AHSO on this project since 2002, and they aim to maintain this partnership for years to come. "It's been a longstanding relationship," says Bennett. "We've benefitted from that partnership…it supports us as a center and it supports their needs."

Diamond McGehee is a doctoral student in the Applied Bioscience program at UA Little Rock. Her research was supported by the Arkansas Space Grant Consortium. The ASGC, which includes 17 four-year universities and colleges in Arkansas, conducts STEM-related aerospace programs and activities for K-12 students.

What brought you to UA Little Rock?

I'm from central Arkansas originally and wanted to be near friends and family. I also became interested in the unique Applied Science program at UA Little Rock. Applied Science is really the functional output of STEM research. I'm interested in the question of, "how do we take what we found and then improve the human experience with that knowledge?" "What can we do to make human life better?"

Tell me about your work with the Arkansas Space Grant Consortium

Currently, NASAs big mission is to colonize Mars. My role is to focus on plant science. Our group combines plant science, animal science, nanotechnology, and genetic modification. People wishing to colonize Mars will need a reproducible food source.

I conducted research on InsP 5-ptase genetically modified tomatoes generated early by Dr. Mariya Khodakovskaya, and presented my findings at the recent NASA conference. My research was specifically in metabolomics, which is studying all of the metabolites (small molecules produced from metabolism) at once. Through my data analysis, I found 10-11 nutrients that are strong antioxidants, which can prevent complications of radiation exposure. Radiation creates free radicals which can destroy your DNA and cause cancer. But if you can neutralize free radicals before they cause damage, you can prevent many instances of cancer.

Our research proved that specific genetic modification improved the total antioxidant concentration in transgenic tomato fruits. In relation to space, instead of trying to predict how much chemotherapy we should send to Mars for cancer treatments, we can instead send them a packet of seeds as a food source and possibly prevent the cancer from forming.

What interests you in this research?

Cancer treatment is near and dear to my heart. Sitting and watching someone suffer through cancer, especially when it's terminal but they have this incredible hope to keep pushing forward, had a huge effect on me. To know that I could possibly do research that could help people in that endeavor is great.

Cancer is a very hot topic right now, and will continue to be since no single cure exists. The best approach, then, is prevention.

I'm also interested in making cancer treatment cheaper. Studies have shown that poverty is a pretty big indicator of a shortened lifespan, and too many people have to choose between groceries and medication.

Who has been the most encouraging during your time at UA Little Rock?

My Principal Investigator is Dr. Mariya Khodakovskaya who is a Professor in the Biology Department. She's the number one person I go to for my research. She keeps me on track and tries to be as encouraging as possible.

My husband has been my number one emotional support throughout this time and has been very encouraging. He's never questioned my decision to pursue my doctorate.

What's the next step with your research?

I would like to see this research move into the public domain so that people can see the everyday effects from it. Right now, it's quarantined to the lab and conferences. I would like the general public to see this type of research and realize how much it can help them. A lot of work is needed between here and there, but I think in the end it can be really great for humanity in general.

Dr. Nitin Agarwal, the Jerry L. Maulden-Entergy Endowed Chair Professor of Information Science at UA Little Rock, has devoted extensive time studying individuals and groups who use social media. One of his projects investigates the phenomenon of cyber flash mobs, unpredicted acts performed by organized groups who meet at a specific location and quickly disperse after the act is performed.

Cyber flash mobs can be used in both peaceful and violent ways and have spread across social media channels such as Facebook and Twitter. With over 100 peer-reviewed publications and five books, Dr. Agarwal is an expert at social media behavior studies. Continuing to delve into this work with more grant projects, he took time to answer questions on his research of deviant flash mobs.

2. **How do cyber flash mobs work, and what are their goals and motivations?**

The way cyber flash mobs work is when self-organized groups of individuals get together in cyberspace, perform an unpredicted act, and quickly disperse into the anonymity of the Web. These group acts are often conducted for the purposes of entertainment but also in many cases these purposes are deviant, e.g., planning a denial of service (DoS) cyberattack, or organizing a global cyber heist. Their motivation is to improve the group's conditions (such as, status or power).

3. **How can cyber flash mobs be dangerous?**

Cyber Flash Mobs can pose a significant threat to society when it has a deviant or harmful intention, i.e., deviant

Predicting Social Media Flash Mobs

Dr. Nitin Agarwal Wins Close to $300,000 to Investigate Behaviors and Motivations Behind Social Media Groups who Conduct Cyber Flash Mobs

1. **What sparked your interest in tracking cyber flash mobs?**

The number of events that are organized using social media channels and invite people for mass participation increased tremendously since the occurrence of the first flash mob that was organized in 2003 by Bill Wasik in Manhattan. The purpose of that flash mob, as Bill Wasik (a senior editor of the Harper's magazine) claimed, was "a social experiment designed to poke fun at hipsters." Then this purpose started to shift from benign or purely entertainment to malicious intents that interested us to study such acts. Our research on studying the behaviors of cyber flash mobs is supported by U.S. Office of Naval Research, Army Research Office, Air Force Research Lab, and National Science Foundation. We gratefully acknowledge this support.

cyber flash mobs. These Deviant Cyber Flash Mobs are categorized as the new face of transnational crime organizations (TCOs) (e.g., "hacktivist" groups) that can pose significant risks to political, social, and economic stability. The deviant cyber flash mob activities can stretch beyond the cyberspace, i.e., in physical spaces. We have applied the models developed to study cyber flash mobs in the area of propaganda dissemination, since the information actors involved in propaganda dissemination and other similar information operations act akin to cyber flash mobs. These actors conduct information operations and conveniently and deceptively hide in the anonymity of the Internet. We have worked very closely with U.S. Department of Defense and NATO Public Affairs Officers, Information Operation Officers and Psychological Operation Officers and studied several

propaganda dissemination campaigns within ISIS (or, Daesh) information networks as well as anti-NATO narrative networks.

4. What do you think the cyber flash mob community will look like over the next 5-10 years?

It is challenging to imagine how the cyber flash mobs will behave and strategize over the next 5-10 years. We have been studying cyber flash mobs for the last 2-3 years and the evolution trajectory has been very steep. More precisely, cyber flash mobs have become highly adept at using various information and communication platforms strategically to coordinate their acts. Rapid technological advancements give rise to more sophisticated behaviors. With new technologies such as virtual reality and augmented reality gaining momentum among consumer applications, we envision opportunities for cyber flash mobs to organize acts more profoundly in virtual spaces as well. This would present exciting challenges for researchers to study these emerging areas.

Additionally, we have observed more disturbing manifestations of cyber flash mobs over the past couple of years. With their deviant behaviors and strategies becoming increasingly advanced, there is a critical need to develop new models to study these behaviors and assist in decision and/or policy making, in order to keep up in this race of technology and policy.

5. What efforts would you like to see used to prevent violent and extremist flash mobs?

First, more research is needed to study these acts to know the motivations behind such deviant acts, to know the way they are formed and evolve, and to be able to predict their outcome. Second, I would like to see the development of effective proactive measures and policies to eliminate the security risks in both cyberspace as well as physical spaces, i.e., Cybernetic Space. And finally, I would like to see laws created that can be imposed against the people who organize and participate in the deviant cyber flash mobs that can lead to violence, security threats, and crimes.

6. What challenges you?

We observe a co-evolution between the information environment and cyber flash mob behavior, meaning as the information and communication technologies are evolving so is the cyber flash mob coordination process. This presents a complex challenge to model the cyber flash mob behavior. Often cyber flash mobs are mobilized using a mix of multiple social media platforms. Studying such flash mobs presents interesting challenges of data collection from multiple platforms and data fusion. Moreover, the media landscape in the social media platforms is highly agile. New platforms emerge frequently and very quickly gain momentum, requiring us (the researchers) to gain understanding of new platforms

and educate us almost constantly with new technologies. Furthermore, we have observed an increasing emergence of disturbing uses of cyber flash mob behaviors that warrants the need for models that afford predictive analysis rather than hindsight analysis.

7. Have you learned anything new from conducting this research?

In our studies of cyber flash mobs, and especially the deviant ones - that have resulted in over fifteen peer-reviewed publications - we have learned various techniques, tactics, and procedures these groups use to disseminate misinformation and propaganda to further certain political agenda. We were recently awarded a 5-year $7.5 million grant from the U.S. Department of Defense under the Multidisciplinary University Research Initiative (MURI) program to develop models to track online groups that have a political focus and agenda. We are partnering with Carnegie Mellon University, University of South Carolina, and University of Pittsburgh in this research effort.

Deviant cyber flash mob groups are technically very savvy and use some of the most advanced techniques to hide in the Internet. We are in the process of forging a highly specialized set of methodologies that fuse computational social network analysis and cyber forensic analysis to create something called social-cyber forensics. Using social-cyber forensic based analysis, we are able to identify hidden or covert connections among group members on one or more social media platforms. Moreover, deviant cyber flash mobs' use of social media platforms is highly strategic. With the use of computer programs, known as bots, deviant cyber flash mobs can massively disseminate messages. We were recently awarded a 3-year $1 million grant from DARPA under the STTR program to develop models to study bots and their coordination behaviors. We partnered with Intelligent Automation, Inc. (IAI) in this research effort.

Turning Data into Ideas

IDEA Data & Research Office Ensures Special Education Programs in Arkansas Help as Many Students as Possible

Access to free quality education is a fundamental component to our society. No matter what children may face, they should all have the opportunity to learn and succeed in school. Thanks to the Individuals with Disabilities Education Act (IDEA), infants and children with disabilities across the country can receive the services they need to develop and succeed in learning environments.

IDEA is specifically designed to protect the rights of children with disabilities that affect their ability to learn and give parents the power to make necessary educational decisions for their children. The six pillars of IDEA cover individualized education programs, free appropriate public education, least restrictive environment, appropriate evaluation, parent and teacher participation, and procedural safeguards.

Monitoring Success in Arkansas

Housed in the Education Building on the UA Little Rock campus, the IDEA Data & Research Office specializes in quality data reporting and management on special education programs for the Arkansas Department of Education's Special Education Unit. The 2004 version of IDEA requires that all school districts in the U.S. provide data and analytics services.

"We're probably one of the best-kept secrets on campus," says director Dr. Jody Fields who has been with the IDEA Data & Research Office for 12 years. "If you want U.S. Department of Education data, this is the process to go through."

This information includes race, demographics, education placement, discipline data, testing data for students in special education programs, and graduation counts. Collecting this information ensures that the right programs are in place to help students in special education programs in the best way possible. If administrators want to see if a program needs to be tweaked or replaced, they can look at reports generated from IDEA Data & Research.

Dr. Fields believes the best part of her job is working with school districts to make sure the right programs are in place and are helping students in special education programs.

"With my background in public administration policy analysis," Dr. Fields explains, "we try to look at the districts and even the state and say, 'how do you implement the changes you're supposed to be achieving for student outcomes or program improvements?'"

> "We're probably one of the best-kept secrets on campus."

Along with reporting and data management, IDEA Data & Research also conducts training seminars for educators to teach them how to correctly enter the right data for these reporting requirements.

Data for Research

Not only can IDEA Data & Research assist the Arkansas Department of Education, they can also assist researchers looking for data to help them conduct studies on education. The office hopes more researchers from the College of Education will seek support from their services. One noteworthy example Dr. Fields remembers was assisting Dr. Jo Ellen McAdams on her project from The NEA Foundation. Dr. McAdams is an associate professor in the UA Little Rock Counselor Education Program. In this project, she conducted a literacy study on how a child's reading fluency increases when they read to dogs.

"Kids who even have problems with reading, and don't really like to read, will go practice "their reading" when they realize they get to read to dogs," explains Dr. Fields. "Their reading fluency actually increases. I hooked the researcher up with a school in Van Buren County and ran the analysis for her."

Dr. Jo Ellen McAdams, the principal investigator in the study who received $10,000 from the National Endowment for the Arts, was pleased to see how her study helped students become better readers.

"The results indicate a strong and highly significant effect on test scores of those children who experienced reading with the dog," Dr. McAdams said. "The children in the experimental group have higher scores than those who did not read to the dog. Those who read to the dog showed an actual increase in the reading fluency score."

The office also helps researchers create and process custom surveys needed for their projects. Using unique survey software, researchers can tailor their surveys to specifically fit the information they're looking for. IDEA Data & Research can then assist in compiling and analyzing the data for the project.

With a dedicated staff of six full-time employees and two graduate assistants, IDEA Data & Research at UA Little Rock ensures that special education programs in Arkansas are as beneficial as possible. When these programs run at their greatest potential, students with special needs can receive the services they need to achieve academic success.

Lifelong Zest for Learning

The Brand New UA Little Rock Lifelong Learning Institute Engages Members of Retirement Community with Educational Opportunities

Hot Springs Village residents look on at the historic artwork of Linda Williams Palmer who has, for the past ten years, researched, photographed, and drawn champion specimens of many native Arkansas trees.

No matter what your age, it is essential to learn and experience new things to live a vibrant, healthy life. Those who are retired now have the freedom to choose what they want to learn and experience at their own pace. Thanks to the new Lifelong Learning Institute at the UA Little Rock Benton Center, residents of the Hot Springs Village community can now expand their learning opportunities by attending various workshops, festivals, skill development classes, and travels.

Working alongside the Hot Springs Village Community Foundation, UA Little Rock provides administrative support for the Institute, which started on October 6, 2016 and currently has 233 members. Lisa Davis, the Director of Distributed Learning at the Institute, has an extensive background in higher education and was excited at the opportunity to bring her expertise to the program.

"Higher education is a high priority for me. What I like the most is bringing my project management experience to the position," Davis reflects. "I like to build programs and create new educational opportunities."

For a tax-deductible yearly fee of $45 per individual or $75 per couple (or a lifetime fee of $500 per individual or $750 per couple), members can receive access to all events, workshops, and travel opportunities. Partnering with the UA Little Rock Benton Center, members can access Ottenheimer Library and receive discounts for the Alumni Association, athletic event tickets, and the University Bookstore.

Catering to the Community
In order to provide relevant programs to residents, the Institute created focus groups and distributed surveys to community members asking what they would like to learn. Davis said they received overwhelming feedback for travel opportunities, history classes, and various educational opportunities.

In the future, the Institute would like to expand their program to provide residents from other states the chance to explore retirement life in Hot Springs Village. But for right now, they are content with making the current programs as engaging and enriching as possible.

"We're starting small. We're trying to do one larger and one smaller program per month right now. That seems to be working out well," says Davis.

The first program the Institute conducted was "Betting on a Great Year," which allowed members to visit the Oaklawn Race Track in Hot Springs and learn about the ins and outs of horse racing. At this event, members toured the horse stables, learned about handicapping, and learned about the park's history. They were also allowed access to the Arlington Hotel in Hot Springs and learned about its history from professional historians.

Members also attended a baseball-themed event and lunch with Bill "Youngblood" McCrary, who was a professional baseball player in the 1940s and 1950s and currently resides in Hot Springs Village. Another guest speaker was Bob Kendrick, president of a non-profit organization in Kansas City honoring the African American baseball players who played in segregated leagues.

Bright Future Ahead
As the UA Little Rock Benton Center continues to expand, Davis is optimistic that this community outreach project will bring more visibility to the satethe Institutete campus and allow more educational opportunities for The Institute members.

Jim Harlow, a board member on the Hot Springs Village Community Foundation, acknowledges how this partnership will allow them to expand their resources to accommodate the resident's need for education and lifelong learning.

"The establishment of our local The Institute-Life Long Learning Institute with our UA Little Rock partner has filled that need very well."

> **"The establishment of our local LLI-Life Long Learning Institute with our UA Little Rock partner has filled that need very well."**

Advancing the Arkansas Economy

A healthy economy creates a robust foundation for communities, businesses, and families. With greater opportunities and access to services, citizens can establish a solid and prosperous financial future.

Thanks to the Arkansas Economic Development Institute (formerly the Institute for Economic Advancement) at UA Little Rock, businesses and communities in Arkansas can receive guidance, support, financial and census data, and training to help them establish a strong economic future.

The Institute provides research, community development services to underdeveloped regions, economic forecasting, labor law education, geographic information systems (GIS), technical assistance, training, and data services for the state of Arkansas.

Assisting the Arkansas and Mississippi Delta Region

One project the Institute assists with is the economic impact model for Southern Bancorp, Inc., a financial institution that provides services to the delta region in Arkansas and Mississippi. Formed in 1986, they also support local businesses and families through various projects, sponsorships, and initiatives.

Dr. Greg Hamilton, Senior Research Economist at the Institute, helped Southern Bancorp track their progress in creating and supporting jobs in Arkansas and Mississippi.

"Through their loans, they are supporting a significant amount of activity throughout the state," Dr. Hamilton said.

With an $18,500 award from Southern Bancorp, Dr. Hamilton was able to analyze data, create statistical models, and write an executive summary that showcased a detailed analysis of the financial institution's work in the community.
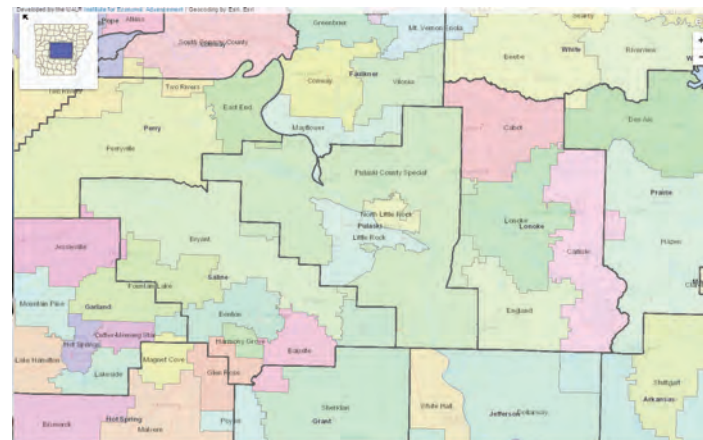
With the Institute's economic research and statistical analysis services, they work with various state and federal agencies to project future economic developments and create policy simulation models.
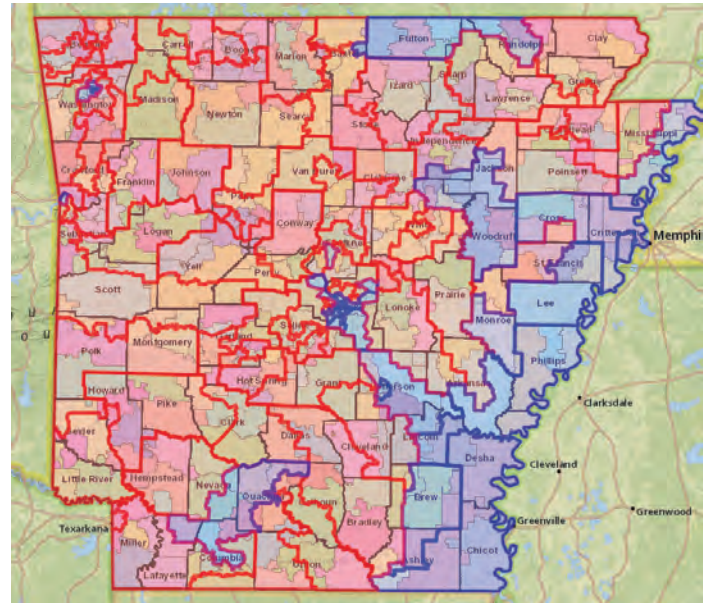
GIS map of state house of representative districts in Arkansas
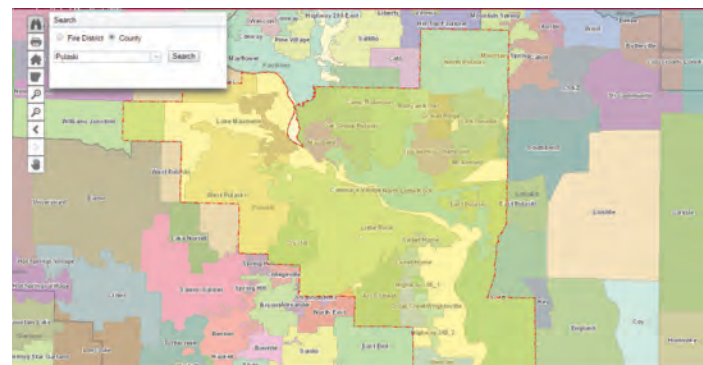
GIS map of fire district boundaries in central Arkansas

GIS map of school district boundaries in central Arkansas

The Arkansas Economic Development Institute at UA Little Rock Provides Wealth of Services for Underdeveloped Regions of Arkansas

Arkansas Census State Data Center

The Institute also houses the lead agency of the Arkansas Census State Data Center (CSDC), the official representative of the U.S. Bureau of the Census in Arkansas. As a network of over 40 agencies and organizations in the state, the CSDC disseminates census data for a variety of applications through multiple media formats.

CSDC provides historical census information; population and housing data; economic census reports; information on children and families; environmental, demographic, and social databases; and geographic information.

Along with this information, they can also provide technical consulting, training services, data analysis, economic census reports, and printed and digital reports.

In 2016, The Institute was able to assist the Arkansas School Readiness Team and the Arkansas Department of Human Services Division of Childcare and Early Childhood Education on their publication, Getting Ready for School, Arkansas Map Data 2016. This publication highlights Arkansas children's developmental indicators for starting and staying in school. These indicators include oral communication skills, vocabulary, ability to process stories, and cognition. The CSDC at The Institute provided data on various factors including children enrolled in the ARKids First insurance program, children served by state and federally funded programs, children under five years old in poverty, and children receiving special education services.

Geographical Information Systems

The Institute also houses the UA Little Rock GIS Applications Laboratory that assists various businesses, government agencies, and schools with data and mapping resources. Their maps include fire district boundary maps, state childcare centers, and political districts that show state senators and representatives.

Along with assisting these agencies, the GIS Applications Laboratory actively supports research on campus from other departments that need GIS services.

Inderpreetsingh Farmahan, who directs the GIS Applications Laboratory at UA Little Rock, has hosted formal training sessions and informal one-on-one training sessions to professors and teachers who want to use GIS in their studies. Because GIS is such a vast topic, Farmahan sees the one-on-one training sessions as an opportunity to cater to the professor's needs rather than giving a broad overview that doesn't pertain to their projects.

"GIS is such a vast topic, and to get in a class of 10-15 people and teach everybody doesn't work all the time, so I give a lot of one on one [trainings]," Farmahan said.

Farmahan holds a bachelor's degree in engineering and a master's degree in management information systems. He uses his expertise to merge the earth sciences field into the business realm by teaching students in the UA Little Rock College of Business how to use unique mapping and data visualization tools. By learning these tools, business students can use mapping technology to enhance their understanding of economics, marketing, and statistics.

Farmahan says the best part of his job at the Institute is the opportunity to help professionals from a variety of disciplines.

"Technology is so fast-changing, and GIS touches every life. That's what I like," reflects Farmahan. "[We help] scientists, commercial businesses, education, and researchers. Certain professions keep you focused and here you're helping everybody. I think that's the best part."

Spotlight on Student Researchers: John Siratt

John Siratt is an undergraduate in the Department of Mathematics and Statistics at UA Little Rock. Currently, he studies automated theorem proving, a subfield of artificial intelligence and mathematical logic that deals with proving mathematical theorems with computer programs. John received a grant from the Arkansas Space Grant Consortium (ASGC) to intern at the NASA Langley Research Center.

What brought you to UA Little Rock?

I originally enrolled at UA Little Rock as a part-time student in the mathematics program. I chose UA Little Rock because it is one of only two research universities in the state. Since coming back to school, my goal has always been academic research, so I felt that it was important to be surrounded by faculty active in research.

Could you tell me about the work you do with the ASGC?

With the support of a Workforce Development grant I received from the ASGC, I will be interning at NASA Langley Research Center this summer with the Formal Methods Research Group. One of the tools the group uses is called PVS. This system allows a user to specify mathematical statements and algorithms and create proofs about them in such a way that the computer can verify the validity of the proof.

The project I will be working on this summer will involve taking rules for great-circle navigation and creating formal algorithm definitions within PVS. Using these definitions, we can prove how these algorithms behave. The algorithms will then be implemented in a programming language. We will then compare this output with our formal definitions through a process called model animation. This process helps program computers to correctly navigate airplanes using spherical trigonometry. This research finds applications in autopilot and autonomous drone systems.

What interests you about this research?

One of the original motivations behind the theory of computation was to automate mathematical reasoning and minimize errors. Historically, this has remained a largely academic endeavor because of the high cost in expertise and time required for such work. However, in mission-critical, safety-critical applications, the extra level of assurance these methods provide has become vital for future projects.

Design errors in important systems have historically resulted in the loss of lives and hundreds of millions of dollars. These design errors can be avoided with more rigorous formal development methods, such as automated theorem proving. Further, mathematicians are interested in using automated theorem proving in pure mathematics to detect subtle errors that are not found in the peer review process.

Have any faculty members been especially beneficial during your time at UA Little Rock?

Dr. Lakeshia Jones from the Department of Mathematics and Statistics is a valued mentor to me. During the past two semesters, she has supervised my independent studies and encouraged me to pursue opportunities such as this grant and internship.

Without her willingness to supervise this independent study, and without her assistance in improving my proof-writing abilities, I would not have been qualified for this position with NASA.

I would also like to mention Dr. Steven Minsker of the Department of Computer Science. He has provided extensive support to prepare me for this research opportunity by supervising my studies in automated reasoning and functional programming.

What do you plan to do with this research after school?

I will begin graduate school at UA Little Rock this coming fall. I hope to continue working in automated theorem proving and formal mathematics. If my internship goes well, I will probably try to work further with the Langley Formal Methods Group by pursuing future internships or seeking collaborative long-distance opportunities.

Pioneering the Healthcare Technology Frontier

Dr. John Talburt and Students from UA Little Rock Information Technology Program Team with UAMS to Enhance Information Technology in the Healthcare Industry

Big Data, which has enabled researchers to see patterns created by online activities, transactions, and digital records, may soon revolutionize the healthcare industry, providing clues that lead to cures for major diseases.

Thanks to a grant from the National Institute of Health, Dr. John Talburt, Professor of Information Science at UA Little Rock, is partnering with Dr. Meredith Zozus of the University of Arkansas for Medical Sciences to improve health information technology. As the only information quality graduate program in the country, UA Little Rock is a perfect partner for this project with UAMS. The students working alongside Drs. Talburt and Zozus are Zhan Wang, Melody Penning, and Pei Wang.

> **"I would like to see [the healthcare industry] catch up with financial services and fully embrace the data quality management paradigm, including data governance and chief data officer role."**

Talburt defines information quality as the practice of "maximizing the value of informational assets of an organization and assuring that the information products create value for the user." Essentially, this means that data can be valuable not only to the organization receiving it, but to the person who transmits that data. For example, using a grocery store rewards card not only gives the store information on your purchases, but it also makes the grocery coupons you receive relevant to your spending habits.

Compared to financial institutions, the healthcare industry's use of information technology has lagged behind. Instead of organizing and examining data when it is first received through electronic records, researchers typically begin examining data when it is piled up in large amounts. They now see the value of quality assurance and quality control on data at the very beginning of the process, which simplifies the analytics on the backend and improves the processing of the data, according to Talburt.

Another valuable asset to using information technology in the medical field is entity resolution, a process that allows a doctor to match up different records to see if they belong to the same patient or not.

"If a doctor only sees one part of your record, and it's missing a lot of tests, he may not prescribe the right drugs or the right procedures," said Talburt.

"On the other hand, if he looks at a record and it has combined you and your twin sister's information, again, he may make a wrong decision. So it's actually quite critical in healthcare that the entity resolution be as accurate as possible."

Setting the standard for information technology education

The UA Little Rock Information Technology program began in 2006 and has continued to be the frontrunner in information technology education in the U.S. Recently, UA Little Rock created the Institute for Chief Data Officers, the first academic institute dedicated to this unique role in information technology. The chief data officer's role is to oversee data strategy, which is essentially answering the question, "What's the best way to manage all of this data?" Gartner Research estimates that 90 percent of large organizations will have a chief data officer by 2019.

Dr. Talburt is the Campus Director of the Institute for Chief Data Officers, and is excited to see how this program can benefit the ongoing research in healthcare.

"I would like to see [the healthcare industry] catch up with financial services and fully embrace the data quality management paradigm, including data governance and chief data officer role. And really focus, not just on the analytics…but [the implementation of] the full operations. [We have so many issues] with the cost of healthcare. So much of that could be addressed in a lot more efficient use of data."

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